

**CHAPTER 9**  
**FIRE PROTECTION AND LIFE SAFETY SYSTEMS**  
**-Note that this Chapter, 780 CMR 9 is unique to Massachusetts-**

**SECTION 901 GENERAL**

**901.1 Scope:** The provisions of 780 CMR 9 shall specify where *fire protection systems* are required and shall apply to the design, installation, maintenance and operation of all *fire systems* in all buildings and structures.

**901.1.1 Seismic Requirements:** All “required” and “non-required” fire protection systems shall be installed in accordance with the applicable Seismic Criteria requirements of 780 CMR 1613, related to the seismic design of fire protection systems.

**901.2 Required systems:** All *fire protection systems* required by 780 CMR shall be installed, repaired, operated and maintained in accordance with this code and the applicable reference standards listed in **Chapter 35**. All required *fire suppression* and *standpipe systems* shall be provided with at least one automatic supply of fire-extinguishing agent of adequate pressure, capacity and reliability to perform the function intended.

**901.3 Nonrequired systems:** Any *fire protection system* or portion thereof not required by 780 CMR shall be permitted to be finished for partial or complete protection provided that such installed system meets applicable requirements of 780 CMR. A building permit shall be required for systems installed pursuant to 780 CMR 901.3.

**901.4 Maintenance:** All water based fire protection systems shall be maintained in accordance with NFPA 25 as listed in **Chapter 35**. All other *fire protection systems* shall be maintained in accordance with the requirements of the applicable reference standards and standards listed in **Chapter 35**. The owner of every building or structure shall be responsible for the care and maintenance of all fire protection systems, including equipment and devices, to ensure the safety and welfare of the occupants. No person shall shut off, disconnect, obstruct, remove or destroy, or cause or permit to be shut off, disconnected, obstructed, removed or destroyed, any part of any sprinkler system, water main, hydrant or other device used for fire protection or carbon monoxide detection and alarm in any building owned, leased or occupied by such person or under his control or supervision, without first procuring a written permit so to do from the head of the fire department of the city or town wherein such building is situated in accordance with M.G.L. c. 148 s. 27A.”

When installations of fire protection systems are interrupted for repairs or other necessary reasons, the owner, tenant or lessee shall immediately advise the local fire department and shall diligently prosecute the restoration of the protection.

**901.5 Threads:** All threads provided for fire department connections to *sprinkler systems, standpipes, yard hydrants* or any other fire hose connection shall be compatible with the connections used by the local fire department.

**901.6 Signs-general:** All signs required to identify fire protection equipment, equipment rooms and equipment locations shall be constructed of durable materials, be permanently installed and be readily visible. Letters and numbers shall contrast with the sign background, shall be at least two inches in height and shall have an appropriate width-to-height ratio to permit the sign to be read easily from a distance of ten feet. The sign and location shall be approved by the local fire department.

**901.6.1 Sprinkler control valve room signage.** Where sprinkler control valves are located in a separate room or building, a sign shall be provided on the entrance door. The lettering shall be at least 2½ inches (63.5 mm) in height and shall otherwise conform to 780 CMR 901.6 and shall read "Sprinkler Control Valves."

**901.6.2 Fire department connections signage.** A metal sign with raised letters at least one inch (25 mm) in height shall be mounted on all fire department connections serving *sprinklers* or *standpipes*. Such signs shall read "Automatic Sprinklers" or "Standpipe," or both, as applicable.

## **901.7 Fire Protection Systems Approval/Acceptance**

**901.7.1 Required:** Complete *fire protection construction documents* shall be submitted in accordance with 780 CMR 110 and this section and a building permit obtained prior to the installation of all "required" or "non required" fire protection systems, including *modifications, alterations, additions or deletions* to an existing fire protection system. The *fire protection construction documents* shall contain sufficient information to completely describe the *fire protection systems*, including operational features. The information required pursuant to 780 CMR 901.7 shall include, where required, the items listed in 780 CMR 901.7.1.1:

**Exception 1:** *Maintenance*; no building permit required.

**Exception 2:** For modifications, alterations, additions or deletions which do not affect system performance or compatibility; no building permit is required unless otherwise directed by the Building Official (Note also refer to M.G.L. c.148, § 27A and c.148, § 10A).

### **901.7.1.1 Fire Protection Construction Documents:**

1. a. Basis (methodology) of design for the protection of the occupancy and hazards for compliance with 780 CMR and applicable NFPA Standards, in the form of a narrative report.
- b. Sequence of operation of all fire protection systems and operation in the form of a narrative report.
- c. Testing criteria to be used for final system acceptance in the form of a narrative report.
2. Building and site access for fire fighting and/or rescue vehicle(s) and personnel.
3. Fire hydrant(s) location and water supply information.
4. Type/description and design layout of the automatic sprinkler system(s).
5. Automatic sprinkler system(s) control equipment location.
6. Type/description and design layout of the automatic standpipe system(s).

7. Standpipe system hose valve(s) type and location.
8. Fire department siamese connection type(s) and location.
9. Type/description and design layout of the fire protective signaling system(s).
10. Fire protective signaling system(s) control equipment and remote annunciator location.
11. Type/description and design layout of the smoke control or exhaust system(s).
12. Smoke control or exhaust system(s) control equipment location.
13. Building life safety system features (auxiliary functions) required to be integrated as part of the fire protective signaling system(s).
14. Type/description and design layout of the fire extinguishing system(s).
15. Fire extinguishing system(s) control equipment location.
16. Fire protection system(s) equipment room location.
17. Fire protection system(s) equipment identification and operation signs.
18. Fire protection system(s) alarm/ supervisory signal transmission method and location.
19. fire command center location.
20. Type/description and location of any emergency alarm system.
21. Type/description and location of any carbon monoxide protection.

**901.7.1.2 Plans:** All fire protection system plans shall contain sufficient information to identify the occupancy, hazards, system and equipment arrangements, system and equipment sizing, systems specifications, systems sequence(s) of operation and design/engineering calculations.

**901.7.1.3 Design:** All fire protection systems and fire protection system operation including building and site features as identified in 780 CMR 901.7.1 1 shall be designed and specified by a qualified *Registered Professional Engineer(s)* except as provided in M.G.L. c. 143, § 54A and any profession or trade as provided in M.G.L. c. 112, § 60L and M.G.L. c. 112, § 81R. All plans shall bear the original seal and signature of the *Registered Professional Engineer(s)*, except as provided in M.G.L. c. 143, § 54A and any profession or trade as provided in M.G.L. c. 112, § 60L and M.G.L. c. 112, § 81R. Specifications shall include requirements for the preparation of shop drawings when required by 780 CMR or applicable NFPA Standards. The *Registered Professional Engineer(s)* or other *legally recognized professional (M.G.L. c. 112, § 81R)* shall be responsible for the review and certify that all shop drawings conform to the approved fire protection *construction documents* as submitted for the building permit and approved by the building official.

**901.7.1.4 As-built plans:** As built plans shall be provided to the building owner for all fire protection and life safety systems that are sealed as reviewed and approved by the registered Professional Engineer or legally recognized professional performing Construction Control. Where changes to original shop drawings are minor, a list of as-built changes shall be permitted to be submitted where sealed a reviewed and approved by the registered Professional Engineer or legally recognized professional performing Construction Control.

**901.7.1.5 Safeguarding Construction:** The *fire protection construction documents* shall provide specifications for conformance to 780 CMR 33 and NFPA-241 listed in **Chapter 35** in order to safeguard against fires during construction, alterations and demolition of all buildings and structures regulated by 780 CMR.

**901.7.2 Authority:** In accordance with the requirements of 780 CMR 110 and 780 CMR 901.7.1 the building official shall transmit one set of the *fire protection construction documents* (780 CMR 901.7.1.1 ) and *building construction documents* to the head of the fire department or his designee for review and approval of the items specified in 780 CMR 901.7.1.1.

**Note:**

1. M.G.L. c. 148 §§ 26G, 26G.5, 26H and 26I, as applicable or otherwise when adopted by a city or town, will impact the fire protection requirements of 780 CMR 9. A building official shall consult **Official Interpretation Number 45-96**, listed in **Appendix B**, for guidance, where communities have adopted M.G.L. c. 148, §§ 26G, 26H, and/or 26I.
2. In addition to the building permit requirements for fire protection systems in 780 CMR, M.G.L. c. 148 § 10A and 527 CMR may impose additional installation permitting requirements.

**901.7.2.1 Alternative Fire Protection Design Methodologies - Independent Engineering**

**Review:** Where alternative design methodologies are utilized and where such methodologies result in designs which vary from any prescriptive requirement of 780 CMR, the owner shall engage an independent registered professional engineer to review said alternative design methodologies. The scope of the independent registered professional engineer review shall include, but not be limited to the following;

- (a) Review of the design assumptions, methodologies and resulting proposed system designs, to determine whether the proposed fire protection system designs and any other systems which are affected by the design assumptions, are consistent with the general objectives and prescriptive provisions of this code and to determine whether or not the methodologies and assumptions conform to accepted engineering practice;
- (b) Preparation of a written report to the building official as to the appropriateness of the proposed design, specifically listing any variances from the prescriptive provisions of 780 CMR and describing, in detail, the design provisions used to achieve compliance.

If the reviewing engineer concurs with the proposed design, the owner shall make application for a variance, to the State Building Code Appeals Board as provided in 780 CMR 122. In addition to all supporting information and materials, the reviewing engineer's report required in 780 CMR 901.7.2.1(b) shall be included in the application for variance.

A building permit shall not be issued until the variance, if required, has been granted, or unless the building permit is issued in part, as provided for in 780 CMR 111.13. When a variance is granted under this section for a bulk merchandising retail building as defined in section 424.2.1, and when the condition appealed is common to future buildings of the owner, the State Building Code Appeals Board, upon request of the owner, may provide that the variance shall be applicable to such future buildings. If such request is made, a quorum of the Board shall hear the appeal. Each such applicability to a future building will be subject to determination as prescribed in section 110.8 by the building official in conjunction with the head of the local fire department that its use is in conformity with the terms of the variance.

**901.7.3 Fire Protection Systems Installation:** Fire protection systems shall be installed by contractors and personnel appropriately licensed in the Commonwealth of Massachusetts (**licensed installing contractor**). Shop drawings required for submittals and reviews by the *Registered Professional Engineer*, or other *legally recognized professional* (M.G.L. c. 112, § 81R), by 780 CMR 901.7.1.3 or by applicable NFPA Standards shall note the name(s), license number(s) and license expiration date(s) of the contractor(s) installing the fire protection systems.

**901.7.4 Acceptance:** In accordance with the provisions of 780 CMR 120, a Certificate of Occupancy shall not issue until the building official and the head of the fire department or their designees have witnessed a satisfactory functional test of all *fire protection systems*, installed in accordance with the approved *fire protection construction documents*. All fire protection systems shall be tested in accordance with the applicable provisions of 780 CMR and NFPA Standards and approved testing criteria and operational sequence as submitted in 780 CMR 901.7.1.1, items 1.b and c. In addition, the following documents and/or information shall be simultaneously submitted to the building official and head of the fire department or their designees prior to the witnessing of the operational fire protection system(s) testing:

1. Certification, from the *Registered Professional Engineer* or other *legally recognized professional* (M.G.L. c. 112, § 81R) responsible for the design in accordance with 780 CMR 901.7.1.3 stating that the fire protection systems have been installed in accordance with the approved *fire protection construction documents* and that he has reviewed the shop drawings for conformance to 780 CMR 901.7.3 and has identified deviations if any, from the approved *fire protection construction documents*.
2. Confirmation by the building owner/developer or authorized representative that they have received the as-built fire protection system shop drawings from the *installing contractor* and that *the Registered Professional Engineer* or other *legally recognized professional* (M.G.L. c. 112, § 81R) has certified their reasonable accuracy.
3. Material, Test, Performance and Completion Certificates, properly executed by the *installing contractor* in accordance with the applicable NFPA Standards.

**Exception:** In lieu of witnessing a satisfactory functional test, the building official and head of the fire department or their designees may accept a final performance acceptance test report from a *Registered Professional Engineer* or other *legally recognized professional* (M.G.L. c. 112, § 81R). Said report shall certify that a complete satisfactory functional test of all fire protection systems in accordance with the approved testing criteria and operational sequence have been witnessed.

**901.7.4.1 Conditional Acceptance:** The requirements of 780 CMR 901.7.4 shall not preclude the issuance of a temporary Certificate of occupancy by the Building Official in accordance with 780 CMR 120.3.

## **SECTION 902 DEFINITIONS**

**902.1 Definitions.** The following words and terms shall, for the purposes of this chapter, and as used elsewhere in this code, have the meanings shown herein.

**ALARM NOTIFICATION APPLIANCE.** A fire alarm system component such as a bell, horn, speaker, light or text display that provides audible, tactile or visible outputs, or any combination thereof.

**ALARM SIGNAL.** A signal indicating an emergency requiring immediate action, such as a signal indicative of fire.

**ALARM VERIFICATION FEATURE.** A feature of automatic fire detection and alarm systems to reduce unwanted alarms wherein smoke detectors report alarm conditions for a

minimum period of time, or confirm alarm conditions within a given time period, after being automatically reset, in order to be accepted as a valid alarm-initiation signal.

**ANNUNCIATOR.** A unit containing one or more indicator lamps, alphanumeric displays or other equivalent means in which each indication provides status information about a circuit, condition or location.

**APPROVAL/PERMIT TO INSTALL:** The term refers to permits outside the jurisdiction of the building official, issued under authority of M.G.L. c. 148, §10A or 527 CMR.

**AUDIBLE ALARM NOTIFICATION APPLIANCE.** A notification appliance that alerts by the sense of hearing.

**AUTHORITY HAVING JURISDICTION:** The term "Authority Having Jurisdiction" as used in the NFPA Standards as referenced in 780 CMR 9, shall mean the building official for enforcement of 780 CMR and the BBRS for interpretation, waiver or variances (see 780 CMR 122.0; see official interpretation number 35-94 listed in Appendix B).

**AUTOMATIC.** As applied to fire protection devices, is a device or system providing an emergency function without the necessity for human intervention and activated as a result of a predetermined temperature rise, rate of temperature rise or combustion products.

**AUTOMATIC FIRE-EXTINGUISHING SYSTEM.** An approved system of devices and equipment which automatically detects a fire and discharges an approved fire-extinguishing agent onto or in the area of a fire.

**AUTOMATIC SPRINKLER SYSTEM.** A sprinkler system, for fire protection purposes, is an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable automatic water supply. The portion of the system above the ground is a network of specially sized or hydraulically designed piping installed in a structure or area, generally overhead, and to which automatic sprinklers are connected in a systematic pattern. The system is usually activated by heat from a fire and discharges water over the fire area.

**AVERAGE AMBIENT SOUND LEVEL.** The root mean square, A-weighted sound pressure level measured over a 24-hour period.

**BAR:** An occupancy offering services primarily for alcoholic beverages with limited food service.

**CARBON DIOXIDE EXTINGUISHING SYSTEMS.** A system supplying carbon dioxide (CO<sub>2</sub>) from a pressurized vessel through fixed pipes and nozzles. The system includes a manual- or automatic-actuating mechanism.

**CARBON MONOXIDE ALARM PROTECTION.** A system comprising of listed devices that respond to carbon monoxide and provides an alarm signal to notify occupants.

**CEILING LIMIT.** The maximum concentration of an air-borne contaminant to which one may be exposed, as published in DOL 29 CFR Part 1910.1000.

**CLEAN AGENT.** Electrically nonconducting, volatile or gaseous fire extinguishant that does not leave a residue upon evaporation.

**CONSTANTLY ATTENDED LOCATION.** A designated location at a facility staffed by trained personnel on a continuous basis where alarm or supervisory signals are monitored and facilities are provided for notification of the fire department or other emergency services.

**CONSTRUCTION DOCUMENTS:** See 780 CMR 2, CONSTRUCTION DOCUMENTS.

**DELUGE SYSTEM.** A sprinkler system employing open sprinklers attached to a piping system connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the sprinklers. When this valve opens, water flows into the piping system and discharges from all sprinklers attached thereto.

**DETECTOR, HEAT.** A fire detector that senses heat produced by burning substances. Heat is the energy produced by combustion that causes substances to rise in temperature.

**DRY-CHEMICAL EXTINGUISHING AGENT.** A powder composed of small particles, usually of sodium bicarbonate, potassium bicarbonate, urea-potassium-based bicarbonate, potassium chloride or monoammonium phosphate, with added particulate material supplemented by special treatment to provide resistance to packing, resistance to moisture absorption (caking) and the proper flow capabilities.

**EMERGENCY ALARM SYSTEM.** A system to provide indication and warning of emergency situations involving hazardous materials.

**EMERGENCY VOICE/ALARM COMMUNICATIONS.** Dedicated manual or automatic facilities for originating and distributing voice instructions, as well as alert and evacuation signals pertaining to a fire or other emergency, to the occupants of a building.

**EXPLOSION.** An effect produced by the sudden violent expansion of gases, that is accompanied by a shock wave or disruption of enclosing materials or structures, or both.

**FIRE ALARM BOX, MANUAL.** See “Manual Fire Alarm Box.”

**FIRE ALARM CONTROL UNIT.** A system component that receives inputs from automatic and manual fire alarm devices and is capable of supplying power to detection devices and transponder(s) or off-premises transmitter(s). The control unit is capable of providing a transfer of power to the notification appliances and transfer of condition to relays or devices.

**FIRE ALARM SIGNAL.** A signal initiated by a fire alarm-initiating device such as a manual

fire alarm box, automatic fire detector, water flow switch, or other device whose activation is indicative of the presence of a fire or fire signature.

**FIRE ALARM SYSTEM.** A system or portion of a combination system consisting of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal-initiating devices and to initiate the appropriate response to those signals.

**FIRE COMMAND CENTER.** The principal attended or unattended location where the status of detection, alarm communications and control systems is displayed, and from which the system(s) can be manually controlled.

**FIRE DEPARTMENT DESIGNEE:** An individual authorized by the chief of the fire department to review and approve fire protection system plans and installation.

**FIRE DETECTOR, AUTOMATIC.** A device designed to detect the presence of a fire signature and to initiate action.

**FIRE PROTECTION SYSTEM.** Approved devices, equipment and systems or combinations of systems used to detect a fire, activate an alarm, extinguish or control a fire, control or manage smoke and products of a fire or any combination thereof.

**FIRE SAFETY FUNCTIONS.** Building and fire control functions that are intended to increase the level of life safety for occupants or to control the spread of harmful effects of fire.

**FOAM-EXTINGUISHING SYSTEM.** A special system discharging a foam made from concentrates, either mechanically or chemically, over the area to be protected.

**HALOGENATED EXTINGUISHING SYSTEM.** A fire-extinguishing system using one or more atoms of an element from the halogen chemical series: fluorine, chlorine, bromine and iodine.

**HEAT DETECTOR.** A fire detector that senses heat produced by burning substances. Heat is the energy produced by combustion that causes substances to rise in temperature.

**HOUSEHOLD FIRE WARNING SYSTEM:** A household fire warning system consists of single or multiple station detectors or a listed control unit with automatic fire detectors and occupant notification appliances. The household fire warning system serves only one dwelling unit, patient room, hotel room or other single area depending on use group requirements.

**INITIATING DEVICE.** A system component that originates transmission of a change-of-state condition, such as in a smoke detector, manual fire alarm box or supervisory switch.

**INSTALLING CONTRACTOR:** An individual or firm duly licensed to install fire protection systems. (See 780 CMR 901.7.3)

· *Automatic Sprinklers Systems - M.G.L. c. 146, §§ 81 through 85A, 528 CMR 11.00 and 12.00*  
· *Fire Extinguishing systems - M.G.L. c. 148, §§ 58, 527 CMR 23.00*



· *Fire Alarm Systems - M.G.L. c. 141, §§ 1 through 10, 237 CMR 1.00 through 6.00*

**LEGALLY RECOGNIZED PROFESSIONAL:** Those recognized under M.G.L. c. 112, § 81R including a person, firm, partnership, corporation or association who prepare plans, specifications or shop drawings for work to be installed by the same person, firm, partnership, corporation or association preparing such plans, specifications or shop drawings.

**LIMITED AREA, SPRINKLER SYSTEM:** An automatic sprinkler system consisting of not more than 20 sprinklers (see 780 CMR 903.3.5.1.1).

**LISTED.** Equipment, materials or services included in a list published by an organization acceptable to the building official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material or service meets identified standards or has been tested and found suitable for a specified purpose.

**MAINTENANCE OF FIRE PROTECTION SYSTEMS:** Replacement or repair of any component or components of a fire protection system, where such does not affect system performance and compatibility. (Also see Modifications, Alterations, Additions or Deletions to Fire Protection Systems). No building permit is required for maintenance. Other permits, however, may be required pursuant to M.G.L. c. 148, § 27A and 527 CMR.

**MANUAL FIRE ALARM BOX.** A manually operated device used to initiate an alarm signal.

**MASTER BOX:** A municipal fire alarm box that may also be operated by remote means.

**MODIFICATIONS, ALTERATIONS, ADDITIONS OR DELETIONS TO FIRE PROTECTION SYSTEMS:** Any changes which affect the performance of the fire protection system. (Also see maintenance). Such changes require a building permit and are subject to other permitting requirements pursuant to M.G.L. c. 148, § 27A.

**MULTIPLE-STATION ALARM DEVICE.** Two or more single-station alarm devices that are capable of interconnection such that actuation of one causes all integral or separate audible alarms to operate. It also can consist of one single-station alarm device having connections to other detectors or to a manual fire alarm box.

**MULTIPLE-STATION SMOKE ALARM.** Two or more single-station alarm devices that are capable of interconnection such that actuation of one causes all integral or separate audible alarms to operate.

**MUNICIPAL FIRE ALARM SYSTEM:** A system of alarm initiating devices, receiving equipment, and connecting circuits (other than a public telephone network) used to transmit alarms from street locations to the public fire service communications center.

**NIGHTCLUB:** An occupancy characterized by any of the following: no theatrical stage accessories other than raised platform; low lighting levels; entertainment by a live band or

recorded music generating above-normal sound levels; later-than-average operating hours; tables and seating arranged or positioned so as to create ill defined aisles; a specific area designated for dancing; service facilities primarily for alcoholic beverages with limited food service; and high occupant load density. A nightclub may not include occupancies used for organized private dining events with the following characteristics: used for events that feature a meal as the primary attraction; used for events that are organized for the purpose of a private function, attendance for each specific event is limited and pre-arranged between the facility operator and the private event organizers, the number of guests is limited by written invitation or limited ticket availability and does not exceed the agreed upon attendance limit; each event has a definite starting and ending time; tables and chairs are arranged in well-defined aisles in such a manner to not impede easy egress; there are no significantly low lighting levels; the maximum documented legal capacity, based upon the available floor space, is not less than 15 feet (net) per occupant; the characteristics of events are strictly controlled by an on-site manager and are made part of a written function event contract.”

**NUISANCE ALARM.** An alarm caused by mechanical failure, malfunction, improper installation or lack of proper maintenance, or an alarm activated by a cause that cannot be determined.

**PRE-ACTION SYSTEMS:** A fire sprinkler system employing automatic sprinklers attached to a piping system containing air with a supplemental fire detection system installed in the same areas as the Actuation of the fire detection system automatically opens a valve that permits water to flow into the sprinkler piping system and to be discharged from any open sprinklers.

**PROPRIETARY SUPERVISING STATION:** Refer to the definition in NFPA-72 and to further details as identified in NFPA-72 as listed in Chapter 35.

**RECORD DRAWINGS.** Drawings (“as built”) that document the location of all devices, appliances, wiring sequences, wiring methods and connections of the components of a fire alarm system as installed.

**REGISTERED PROFESSIONAL ENGINEER:** A Registered Professional Engineer registered by the Board of Registration of Professional Engineers and of Land Surveyors in accordance with M.G.L. c. 112, §§ 81D through 81T and 250 CMR.

**REMOTE STATION FIRE ALARM SYSTEM SUPERVISING STATION:** Refer to the definitions in NFPA-72 and to further details as identified in NFPA-72 as listed in Chapter 35.

**SINGLE-STATION SMOKE ALARM.** An assembly incorporating the detector, the control equipment and the alarm-sounding device in one unit, operated from a power supply either in the unit or obtained at the point of installation.

**SHOP DRAWINGS:** Scaled detailed working drawings (system layout) and equipment specifications (cut sheets) indicating all information in accordance with requirements of the applicable NFPA Standards for the specific fire protection systems to be installed in accordance with the plans and specifications prepared by a *Registered Professional Engineer* or *Legally*

*Recognized Professional.*

**SMOKE ALARM.** A single- or multiple-station alarm responsive to smoke and not connected to a system.

**SMOKE DETECTOR.** A listed device that senses visible or invisible particles of combustion.

**SMOKEPROOF ENCLOSURE.** An exit stairway designed and constructed so that the movement of the products of combustion produced by a fire occurring in any part of the building into the enclosure is limited.

**SPRINKLER:** A device, connected to a water supply system, that discharges water in a specific pattern for extinguishment or control of fire.

**STANDPIPE SYSTEM, CLASSES OF.** Standpipe classes are as follows:

**Class I system.** A system providing 2.5-inch (64 mm) hose connections to supply water for use by fire departments and those trained in handling heavy fire streams.

**Class II system.** A system providing 1.5-inch (38 mm) hose stations to supply water for use primarily by the building occupants or by the fire department during initial response.

**Class III system.** A system providing 1.5-inch (38 mm) hose stations to supply water for use by building occupants and 2.5-inch (64 mm) hose connections to supply a larger volume of water for use by fire departments and those trained in handling heavy fire streams.

**STANDPIPE, TYPES OF.** Standpipe types are as follows:

**Automatic dry.** A dry standpipe system, normally filled with pressurized air, that is arranged through the use of a device, such as dry pipe valve, to admit water into the system piping automatically upon the opening of a hose valve. The water supply for an automatic dry standpipe system shall be capable of supplying the system demand.

**Automatic wet.** A wet standpipe system that has a water supply that is capable of supplying the system demand automatically.

**Manual dry.** A dry standpipe system that does not have a permanent water supply attached to the system. Manual dry standpipe systems require water from a fire department pumper to be pumped into the system through the fire department connection in order to meet the system demand.

**Manual wet.** A wet standpipe system connected to a water supply for the purpose of maintaining water within the system but does not have a water supply capable of delivering the system demand attached to the system. Manual-wet standpipe systems require water from a fire department pumper (or the like) to be pumped into the system in order to meet the system demand.

**Semiautomatic dry.** A dry standpipe system that is arranged through the use of a device, such as a deluge valve, to admit water into the system piping upon activation of a remote control device located at a hose connection. A remote control activation device shall be provided at each hose connection. The water supply for a semiautomatic dry standpipe system shall be capable of supplying the system demand.

**SUPERVISING STATION.** A facility that receives signals and at which personnel are in

attendance at all times to respond to these signals.

**SUPERVISORY SERVICE.** The service required to monitor performance of guard tours and the operative condition of fixed suppression systems or other systems for the protection of life and property.

**SUPERVISORY SIGNAL.** A signal indicating the need of action in connection with the supervision of guard tours, the fire suppression systems or equipment or the maintenance features of related systems.

**SUPERVISORY SIGNAL-INITIATING DEVICE.** An initiation device, such as a valve supervisory switch, water-level indicator or low-air pressure switch on a dry-pipe sprinkler system, whose change of state signals an off-normal condition and its restoration to normal of a fire protection or life safety system, or a need for action in connection with guard tours, fire suppression systems or equipment or maintenance features of related systems.

**TIRES, BULK STORAGE OF.** Storage of tires where the area available for storage exceeds 20,000 cubic feet (566 m<sup>3</sup>).

**TROUBLE SIGNAL.** A signal initiated by the fire alarm system or device indicative of a fault in a monitored circuit or component.

**U.L. LISTED OR FM APPROVED CENTRAL STATION SERVICE:** Central station service as defined in NFPA-72 and as further identified in NFPA 72 as listed in Chapter 35.

**VISIBLE ALARM NOTIFICATION APPLIANCE.** A notification appliance that alerts by the sense of sight.

**WATER SUPPLY AUTOMATIC:** A water supply that is not dependent on any manual operation, such as making connections, operating valves or starting pumps.

**WET-CHEMICAL EXTINGUISHING SYSTEM.** A solution of water and potassium-carbonate-based chemical, potassium-acetate-based chemical or a combination thereof, forming an extinguishing agent.

**WIRELESS PROTECTION SYSTEM.** A system or a part of a system that can transmit and receive signals without the aid of wire.

**ZONE.** A defined area within the protected premises. A zone can define an area from which a signal can be received, an area to which a signal can be sent or an area in which a form of control can be executed.

## **SECTION 903 AUTOMATIC SPRINKLER SYSTEMS**

**903.1 General.** Automatic sprinkler systems shall comply with this section.

**903.1.1 Sprinklered throughout.** Sprinklered throughout shall mean sprinkler protection in all areas required by the applicable design and installation automatic fire sprinkler standard and this Code.

**903.2 Where required.** Automatic sprinkler systems in buildings and structures shall be provided in the locations described in this section. (Also see Note 1)

**Exceptions:**

1. Any room where the application of water, or flame and water, constitutes a serious life or fire hazard and protected by an alternative automatic fire-extinguishing system in accordance with 903.1.1.

2. Spaces or areas in telecommunications buildings used exclusively for telecommunications equipment, associated electrical power distribution equipment, batteries and standby engines, provided those spaces or areas are equipped throughout with an automatic fire alarm system in accordance with 780 CMR 907 and are separated from the remainder of the building by a wall with a fire-resistance rating of not less than 1 hour and a floor/ceiling assembly with a fire-resistance rating of not less than 2 hours.

3. Portions of buildings that comply with 780 CMR 406.0 for open parking structures less than 70 feet in height above mean grade.

4. Automatic sprinkler protection shall not be provided in: (a) elevator machine rooms of traction/drum elevators; (b) elevator machine rooms of hydraulic elevators; (c) elevator hoistways and elevator pits. Such elevator machine rooms and hoistway/pit enclosures shall be constructed to afford at least the fire-resistance rating specified in Table 601 and otherwise as required/allowed by the applicable portions of 780 CMR Chapter 7 (typically, but not always, the hoistway/pit and machine room will have a minimum fire-resistance rating of 2 hours with elevator opening protectives rated at 1 1/2 hours but ratings of 1 hour for hoistway/pit and machine rooms and 3/4 hours for elevator opening protectives may be allowed). Where Table 602 requires a higher fire-resistance rating for elevator machine rooms, hoistways and/or pits, such rating must be provided unless such ratings are governed by other Building Code Sections.

For elevator installation within atriums also see 780 CMR 404 for additional fire-resistance rating guidance. Where the elevator machine room is determined to be a true penthouse roof structure, also refer to 780 CMR 1509 for additional fire-resistance rating requirements.

5. Sprinklers shall not be required in noncombustible and limited combustibles concealed spaces and plenums that contain electrical, data, communications and other cables that are of the types and in the configurations permitted in such spaces by the *Massachusetts Electrical Code* (527 CMR 12).

6. Sprinklers may be omitted in Transformer Vaults where all the following conditions are

satisfied:

1. The cable within the vault is flame retardant or limited combustible.
2. The dielectric fluid is a limited combustible fluid.
3. The vault is enclosed in three hour fire resistance rated construction.
4. The vault is at grade or no more than one level below grade. Access to the vault is directly from the exterior or via a dedicated two hour passageway.
5. The vault is protected with automatic smoke detection connected to the building fire alarm system which notifies the fire department upon activation.
6. The room is limited to the sole use of the transformer equipment and is limited in size to accommodate said equipment only. Storage is prohibited in the vault enclosure.
7. The vault is provided with spill containment.
8. An emergency fire plan has been developed with and approved by the fire department.
9. Continuous ventilation is provided for the vault enclosure in accordance with the ventilation requirements of NFPA 30.
10. The ventilation equipment is dedicated to serve the vault only.
11. Emergency power is provided for the ventilation equipment.
12. The vault is no larger in area than 2400 sq. ft.

7. Sprinklers may be omitted in Transformer Vaults where all the following conditions are satisfied:

1. An alternative suppression system is provided for the vault.
2. Continuous ventilation is provided for the vault enclosure in accordance with the ventilation requirements of NFPA 30. Emergency power shall be provided for the ventilation equipment and the ventilation shall be dedicated to serve the vault only.

Note 1: Automatic sprinkler systems may be required by Section 26A, Section 26A½, Section 26G, Section 26G½, Section 26H or Section 26I in MGL Ch. 148.

**903.2.1 Group A.** An automatic sprinkler system shall be provided throughout buildings having a Group A occupancy as provided in this section.

**903.2.1.1 Group A-1.** An automatic sprinkler system shall be provided throughout buildings having a Group A-1 occupancy.

**903.2.1.2 Group A-2.** An automatic sprinkler system shall be provided throughout buildings as further described in 780 CMR 903.2.1.2.1 and 903.2.1.2.2.

**903.2.1.2.1 Group A-2nc.** An automatic sprinkler system shall be provided throughout buildings having a Group A-2nc occupancy where the occupant load is 50 or greater.

**903.2.1.2.2 Group A-2r.** An automatic sprinkler system shall be provided throughout buildings having a Group A-2r occupancy where any of the following conditions exists:

1. The floor area exceeds 5,000 square feet (464.5 m<sup>2</sup>).
2. The floor area has an occupant load of 300 or more.
3. The floor area is located on a floor other than the level of exit discharge.

**903.2.1.3 Group A-3.** An automatic sprinkler system shall be provided throughout buildings having a Group A-3 occupancy where any of the following conditions exists:

1. The aggregate floor area of the building exceeds 5,000 square feet (1115 m<sup>2</sup>).
2. The Group A-3 occupancy has an occupant load of 300 or more.
3. The Group A-3 occupancy is located on a floor other than the level of exit discharge.

**Exception:** Areas used exclusively as participant sports areas where the main floor area is located at the same level as the level of exit discharge of the main entrance and exit.

**903.2.1.4 Group A-4.** An automatic sprinkler system shall be provided throughout buildings having a Group A-4 occupancy where any of the following conditions exists:

1. The aggregate floor area of the building exceeds 7,500 square feet (1115 m<sup>2</sup>).
2. The Group A-4 occupancy has an occupant load of 300 or more.
3. The Group A-4 occupancy is located on a floor other than the level of exit discharge.

**Exception:** Areas used exclusively as participant sports areas where the main floor area is located at the same level as the level of exit discharge of the main entrance and exit.

**903.2.1.5 Group A-5.** An automatic sprinkler system shall be provided in concession stands, retail areas, press boxes and other accessory use areas in excess of 1,000 square feet (93 m<sup>2</sup>).

**903.2.2 Group B.** An automatic sprinkler system shall be provided throughout buildings having a Group B occupancies where the aggregate floor area of the building exceeds 12,000 square feet (1115 m<sup>2</sup>).

**903.2. 3 Group E.** An automatic sprinkler system shall be provided for Group E occupancies as follows: where the aggregate floor area is greater than 12,000 square feet (1115 m<sup>2</sup>) in area.

2. Throughout every portion of educational buildings below the level of exit discharge.

**903.2.4 Group F-1.** An automatic sprinkler system shall be provided throughout buildings having a Group F-1 occupancy-where any of the following conditions exists:

1. The aggregate floor area of the building exceeds 12,000 square feet (1115 m<sup>2</sup>);
2. Group F-1 occupancy is located more than three stories above grade.
3. Where there is a woodworking operation in excess of 2,500 square feet (232 m<sup>2</sup>) in area that generates finely divided combustible waste or uses finely divided combustible materials.

**903.2.5 Group H.** An automatic sprinkler system shall be provided throughout all buildings having a Group H occupancy.

Exception: See 903.3.1.1.1

**903.2.5.1 Pyroxylin plastics.** An automatic sprinkler system shall be provided in buildings, or

portions thereof, where cellulose nitrate film or pyroxylin plastics are manufactured, stored or handled in quantities exceeding 100 pounds (45 kg) (Also refer to 527 CMR).

**903.2.6 Group I.** An automatic sprinkler system shall be provided throughout buildings with a Group I occupancy.

**Exception:** An automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 shall be allowed in Group I-1 facilities.

**903.2.7 Group M.** An automatic sprinkler system shall be provided throughout buildings containing a Group M occupancy where any of the following conditions exists:

1. The aggregate floor area of the building exceeds 12,000 square feet (1115 m<sup>2</sup>);
2. The Group M occupancy is located more than three stories above grade;
3. Bulk merchandising stores as defined in 426.0.

**903.2.8 Group R.** An automatic sprinkler system installed in accordance with Section 903.3 shall be provided throughout all buildings with a Group R occupancy. For Use Group R Buildings with an aggregate building area of 12,000 sf or more, the sprinkler system shall be designed and installed in accordance with NFPA 13. For the purposes of this section, the aggregate building area shall be the combined area of all stories of the building and fire walls shall not be considered to create separate buildings.

**Exception 1:** Buildings, other than R-1 Occupancies and R-2 Dormitories, having no more than three dwelling units shall be permitted to have an automatic fire suppression system installed in accordance with 903.3.1.3, provided that every automatic sprinkler system shall have at least one automatic water supply or a stored water supply source in accordance with NFPA-13D where the minimum quantity of stored water shall equal the water demand rate times 20 minutes.

**Exception 2:** For one- or two-family “stand-alone” dwellings classified as R-3 buildings, refer to 780 CMR 5303.13.5 – Note, however, that townhouses are required to be sprinklered.

**903.2.9 Group S-1.** An automatic sprinkler system shall be provided for Group S-1 occupancies as follows:

1. Throughout the building where the aggregate floor area of the building is greater than 12,000 square feet in area.
2. Throughout the building, where a Group S-1 occupancy is located more than three stories above grade-

**903.2.9.1 Repair garages.** An automatic sprinkler system shall be provided throughout all buildings having a repair garages where any of the following conditions exists:

1. Where the building is two or more stories in height, including basements, and contains a repair garage exceeding 10,000 square feet (929 m<sup>2</sup>).
2. The aggregate floor area of the building exceeds 12,000 square feet (1115 m<sup>2</sup>).
3. A repair garage is located in a basement.



**903.2.10 Group S-2.**-An automatic sprinkler system shall be provided for Group S-2 occupancies as follows:

1. Throughout buildings classified as Group S-2 Enclosed Parking.
2. Throughout Group S-2 Enclosed Parking located beneath other groups.

**903.2.10.1 Commercial parking garages.** An automatic sprinkler system shall be provided throughout buildings used for storage of commercial trucks or buses where the aggregate floor area used for parking exceeds 5,000 square feet (464 m<sup>2</sup>).

**903.2.11 All occupancies (except Groups R-3 and U).** An automatic sprinkler system shall be installed in the locations set forth in Sections 903.2.11.1 through 903.2.11.1.3.

**Exception:** Group R-3 and Group U.

**903.2.11.1 Stories and basements without openings.** An automatic sprinkler system shall be installed throughout every story or basement of all buildings where the floor area exceeds 1,500 square feet (139.4 m<sup>2</sup>) and where there is not provided at least one of the following types of exterior wall openings:

1. Openings below grade that lead directly to ground level by an exterior stairway complying with Section 1009 or an outside ramp complying with Section 1010. Openings shall be located in each 50 linear feet (15 240 mm), or fraction thereof, of exterior wall in the story on at least one side.
2. Openings entirely above the adjoining ground level totaling at least 20 square feet (1.86 m<sup>2</sup>) in each 50 linear feet (15 240 mm), or fraction thereof, of exterior wall in the story on at least one side.

**903.2.11.1.1 Opening dimensions and access.** Openings shall have a minimum dimension of not less than 30 inches (762 mm). Such openings shall be accessible to the fire department from the exterior and shall not be obstructed in a manner that fire fighting or rescue cannot be accomplished from the exterior.

**903.2.11.1.2 Openings on one side only.** Where openings in a story are provided on only one side and the opposite wall of such story is more than 75 feet (22 860 mm) from such openings, the story shall be equipped throughout with an approved automatic sprinkler system, or openings as specified above shall be provided on at least two sides of the story.

**903.2.11.1.3 Basements.** Where any portion of a basement is located more than 75 feet (22 860 mm) from openings required by Section 903.2.10.1, the basement shall be equipped throughout with an approved automatic sprinkler system.

**903.2.11.2 Rubbish and linen chutes.** An automatic sprinkler system shall be installed at or above the topmost service opening of rubbish and linen chutes and in their terminal rooms. Chutes extending through three or more floors shall have additional sprinkler heads installed within such chutes at alternate floors. Chute sprinklers shall be accessible for servicing.

**903.2.11.3 Buildings over 55 feet in height.** An automatic sprinkler system shall be installed throughout buildings with a floor level having an occupant load of 30 or more that is located 55 feet (16 764 mm) or more above the lowest level of fire department vehicle access.

**Exceptions:**

1. Airport control towers.
2. Open parking structures.

**903.2.12 Other required suppression systems.** In addition to the requirements of Section 903.2, the provisions indicated in Table 903.2.12 also require the installation of a suppression system for certain buildings and areas.

**TABLE 903.2.12  
ADDITIONAL REQUIRED OR POTENTIALLY REQUIRED  
SUPPRESSION/EXTINGUISHING SYSTEMS**

<b>SECTION</b>	<b>SUBJECT</b>
Table 302.1.1	Incidental Use Areas
402.8	Covered malls
403.2	High-rise buildings
404.3	Atriums
405.3	Underground structures
407.5	Group I-2
410.6	Stages
411.4	Special amusement buildings
412.2.5, 412.2.6	Aircraft hangars
415.7.2.4	Group H-2*
416.4	Flammable finishes
417.4	Drying rooms
422.4.6, 422.5.2	Day care centers
422.5.3	Day care centers
424.5	Bulk Merchandising Retail Buildings
425.3.5	Limited Group Residence
426.9.1	Detoxification Facilities
427.2 as applicable	Group Dwelling Units
507	Unlimited area buildings
IMC	Commercial cooking operations
IMC	Ducts conveying hazardous exhausts
IFC-Section 903,	Numerous
IFC-Section 904	Numerous
MGL 148 § 26A	High-rise
MGL 148 § 26A½	High-rise
MGL 148 § 26G	Buildings over 7,500 ft <sup>2</sup> (local option law)
MGL 148 § 26G½	Nightclubs
MGL 148 § 26H	Lodging Houses (local option law)
MGL 148 § 26I	4 or more residential units (local option law)

\*Review all H USES for possible sprinklering requirements.

**903.3 Installation requirements.** Automatic sprinkler systems shall be designed and installed in accordance with Sections 903.3.1 through 903.3.7.

**903.3.1 Standards.** Sprinkler systems shall be designed and installed in accordance with Section 903.3.1.1, 903.3.1.2 or 903.3.1.3.

**903.3.1.1 NFPA 13 sprinkler systems.** Where the provisions of this code require that a building or portion thereof be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, sprinklers shall be installed throughout in accordance with NFPA 13 except as provided in Section 903.3.1.1.1.

**903.3.1.1.1 Exempt locations.** Automatic sprinklers shall not be required in the following rooms or areas: Refer to 780 CMR 903.2, Exceptions.

**903.3.1.2 NFPA 13R sprinkler systems.** Where allowed in buildings of Group R, up to and including four stories in height, automatic sprinkler systems shall be installed throughout in accordance with NFPA 13R.

**903.3.1.2.1 Balconies.** Sprinkler protection shall be provided for exterior balconies and ground-floor patios of dwelling units where the building is of Type V construction. Sidewall sprinklers that are used to protect such areas shall be permitted to be located such that their deflectors are within 1 inch (25 mm) to 6 inches (152 mm) below the structural members, and a maximum distance of 14 inches (356 mm) below the deck of the exterior balconies that are constructed of open wood joist construction.

**903.3.1.3 NFPA 13D sprinkler systems.** Where allowed, automatic sprinkler systems in shall be installed throughout in accordance with NFPA 13D.

**903.3.2 Fast response automatic sprinklers.** Where automatic sprinkler systems are required by this code, fast response automatic sprinklers shall be installed in the following areas in accordance with Section 903.3.1 and their listings:

1. Throughout all spaces within a smoke compartment containing patient sleeping units in Group I-2 in accordance with this code.
2. In Group R and I-1 occupancies.
3. Light-hazard occupancies as defined in NFPA 13.
4. Residential sprinklers shall be installed in areas where one or more rooms are arranged for the use of one or more individuals living together, as in a single housekeeping unit normally having cooking, living, sanitary or sleeping facilities including but not limited to: hotel rooms, dorm rooms, apartment units, condo units, and sleeping rooms in nursing homes and hospitals.

**903.3.3 Obstructed locations.** Automatic sprinklers shall be installed with due regard to obstructions that will delay activation or obstruct the water distribution pattern. Automatic sprinklers shall be installed in or under covered kiosks, displays, booths, concession stands, or equipment that exceeds 4 feet (1219 mm) in width. Not less than a 3-foot (914 mm) clearance

shall be maintained between automatic sprinklers and the top of piles of combustible fibers.

**Exception:** Kitchen equipment under exhaust hoods protected with a fire-extinguishing system in accordance with Section 904.

**903.3.4 Actuation.** Automatic sprinkler systems shall be automatically actuated unless specifically provided for in this code.

**903.3.5 Water supplies.** Water supplies for automatic sprinkler systems shall comply with this section and the standards referenced in Section 903.3.1. The potable water supply shall be protected against backflow in accordance with 310 CMR 22.22.

**903.3.5.1 Domestic services.** Where the domestic service provides the water supply for the automatic sprinkler system, the supply shall be in accordance with this section.

**903.3.5.1.1 Limited area sprinkler systems.** Limited area sprinkler systems serving fewer than 20 sprinklers on any single connection are permitted to be connected to the domestic service where a wet automatic standpipe is not available. Limited area sprinkler systems connected to domestic water supplies shall comply with each of the following requirements:

1. Valves shall not be installed between the domestic water riser control valve and the sprinklers.

**Exception:** An approved indicating control valve supervised in the open position in accordance with Section 903.4.

2. The domestic service shall be capable of supplying the simultaneous domestic demand and the sprinkler demand required to be hydraulically calculated by NFPA 13, NFPA 13R or NFPA 13D.

**903.3.5.1.2 Combination services.** A single combination water supply shall be permitted provided that the domestic and/or commercial demand is added to the sprinkler demand as required by NFPA 13, NFPA 13D or NFPA 13R as applicable.

**903.3.5.2 Secondary water supply.** A secondary on-site water supply equal to the hydraulically calculated sprinkler demand, including the hose stream requirement, shall be provided for high-rise buildings in Seismic Design Category C, D, E or F as determined by this code. The secondary water supply shall have a duration not less than 30 minutes as determined by the occupancy hazard classification in accordance with NFPA 13.

**Exception:** Existing buildings.

**903.3.6 Hose threads.** Fire hose threads used in connection with automatic sprinkler systems shall be approved and compatible with fire department hose threads.

**903.3.7 Fire department connections.** The location of fire department connections shall be approved by the head of the fire department. Fire department connections shall not be obstructed by fences, bushes, trees, walls, or any other similar object(s).

**903.3.7.1 Locking fire department connection (FDC) caps.** The head of the fire department is authorized to require locking FDC caps on fire department connections for water-based fire

protection systems where the responding fire department carries appropriate key wrenches for removal.

**903.3.7.2 Connections.** Fire department connections shall be arranged in such a manner that the attachment to any one water sprinkler connection will serve all sprinklers.

**903.4. Alarms.** Approved audible and visual alarm devices shall be connected to every water sprinkler system. Such alarm devices shall be activated by water flow and shall be located in an approved location on the exterior of the building and throughout the building in accordance with the requirements of 780 CMR 907.

**903.5 Floor control valves.** Approved supervised indicating control valves shall be provided at the point of connection to the riser on each floor in high-rise buildings.

**903.6-Inspection, testing, and maintenance.** Sprinkler systems shall be inspected, tested and maintained in accordance with 527 CMR and NFPA 25.

## **SECTION 904 ALTERNATIVE AUTOMATIC FIRE-EXTINGUISHING SYSTEMS**

**904.1 General.** Automatic fire-extinguishing systems, other than automatic sprinkler systems, shall be designed, installed, inspected, tested and maintained in accordance with the provisions of this section and the applicable referenced standards.

**904.2 Where required.** Automatic fire-extinguishing systems installed as an alternative to the required automatic sprinkler systems of Section 903 shall be approved by the building official. Automatic fire-extinguishing systems shall not be considered alternatives for the purposes of exceptions or reductions permitted by other requirements of this code.

**904.2.1 Hood system suppression.** Each required commercial kitchen exhaust hood and duct system required by the 527 CMR or the *International Mechanical Code* to have a Type I hood shall be protected with an approved automatic fire-extinguishing system installed in accordance with this code.

**904.3 Installation.** Automatic fire-extinguishing systems shall be installed in accordance with this section.

**904.3.1 Electrical wiring.** Electrical wiring shall be in accordance with 527 CMR 12.

**904.3.2 Actuation.** Automatic fire-extinguishing systems shall be automatically actuated and provided with a manual means of actuation in accordance with Section 904.11.1.

**904.3.3 System interlocking.** Automatic equipment interlocks with fuel shutoffs, ventilation controls, door closers, window shutters, conveyor openings, smoke and heat vents and other features necessary for proper operation of the fire-extinguishing system shall be provided as required by the design and installation standard utilized for the hazard.

**904.3.4 Alarms and warning signs.** Where alarms are required to indicate the operation of automatic fire-extinguishing systems, distinctive audible and visible alarms and warning signs shall be provided to warn of pending agent discharge. Where exposure to automatic-extinguishing agents poses a hazard to persons and a delay is required to ensure the evacuation of occupants before agent discharge, a separate warning signal shall be provided to alert occupants once agent discharge has begun. Audible signals shall be in accordance with Section 907.9.2.

**904.3.5 Monitoring.** Where a building fire alarm system is installed, automatic fire-extinguishing systems shall be monitored by the building fire alarm system in accordance with *NFPA 72*.

**904.4 Inspection and testing.** Automatic fire-extinguishing systems shall be inspected and tested in accordance with the provisions of this section prior to acceptance.

**904.4.1 Inspection.** Prior to conducting final acceptance tests, the following items shall be inspected:

1. Hazard specification for consistency with design hazard.
2. Type, location and spacing of automatic- and manual-initiating devices.
3. Size, placement and position of nozzles or discharge orifices.
4. Location and identification of audible and visible alarm devices.
5. Identification of devices with proper designations.
6. Operating instructions.

**904.4.2 Alarm testing.** Notification appliances, connections to fire alarm systems and connections to approved supervising stations shall be tested in accordance with this section and Section 907 to verify proper operation.

**904.4.2.1 Audible and visible signals.** The audibility and visibility of notification appliances signaling agent discharge or system operation, where required, shall be verified.

**904.4.3 Monitor testing.** Connections to protected premises and supervising station fire alarm systems shall be tested to verify proper identification and retransmission of alarms from automatic fire-extinguishing systems.

**904.5 Wet-chemical systems.** Wet-chemical extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with *NFPA 17A* and their listing.

**904.5.1 Discharge test:** All systems shall be tested by a discharge of expellant gas through the piping and nozzles with observations being made of the flow of expellant gas through all nozzles as well as observing for leakage and continuity of piping with free unobstructed flow.

**904.6 Dry-chemical systems.** Dry-chemical extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with *NFPA 17* and their listing.

**904.6.1 Discharge test:** All systems shall be tested by a discharge of expellant gas through the piping and nozzles with observations being made of the flow of expellant gas through all nozzles as well as observing for leakage and continuity of piping with free unobstructed flow.

**904.7 Foam systems.** Foam-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with *NFPA 11* and *NFPA 16* and their listing.

**904.8 Carbon dioxide systems.** Carbon dioxide extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with *NFPA 12* and their listing.

**904.9 Halon systems.** Halogenated extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with *NFPA 12A* and their listing.

**904.10 Clean-agent systems.** Clean-agent fire-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with *NFPA 2001* and their listing.

**904.11 Commercial cooking systems.** The automatic fire-extinguishing system for commercial cooking systems shall be of a type recognized for protection of commercial cooking equipment and exhaust systems of the type and arrangement protected. Preengineered automatic dry- and wet-chemical extinguishing systems shall be tested in accordance with *UL 300* and listed and labeled for the intended application. Other types of automatic fire-extinguishing systems shall be listed and labeled for specific use as protection for commercial cooking operations. The system shall be installed in accordance with this code, its listing and the manufacturer's installation instructions. Automatic fire-extinguishing systems of the following types shall be installed in accordance with the referenced standard indicated, as shown:

1. Carbon dioxide extinguishing systems, *NFPA 12*.
2. Automatic sprinkler systems, *NFPA 13*.
3. Foam-water sprinkler system or foam-water spray systems, *NFPA 16*.
4. Dry-chemical extinguishing systems, *NFPA 17*.
5. Wet-chemical extinguishing systems, *NFPA 17A*.

**Exception:** Factory-built commercial cooking recirculating systems that are tested in accordance with *UL 197*, and listed, labeled and installed in accordance with Section 304.1 of the International Mechanical Code.

**904.11.1 Manual system operation.** A manual actuation device shall be located at or near a means of egress from the cooking area, a minimum of 10 feet (3048 mm) and a maximum of 20 feet (6096 mm) from the kitchen exhaust system. The manual actuation device shall be located a minimum of 4 feet (1219 mm) and a maximum of 5 feet (1524 mm) above the floor. The manual actuation shall require a maximum force of 40 pounds (178 N) and a maximum movement of 14 inches (356 mm) to actuate the fire suppression system.

**Exception:** Automatic sprinkler systems shall not be required to be equipped with manual actuation means.

**904.11.2 System interconnection.** The actuation of the fire suppression system shall

automatically shut down the fuel or electrical power supply to the cooking equipment. The fuel and electrical supply reset shall be manual.

**904.11.3 Carbon dioxide systems.** When carbon dioxide systems are used, there shall be a nozzle at the top of the ventilating duct. Additional nozzles that are symmetrically arranged to give uniform distribution shall be installed within vertical ducts exceeding 20 feet (6096 mm) and horizontal ducts exceeding 50 feet (15 240 mm). Dampers shall be installed at either the top or the bottom of the duct and shall be arranged to operate automatically upon activation of the fire-extinguishing system. Where the damper is installed at the top of the duct, the top nozzle shall be immediately below the damper. Automatic carbon dioxide fire-extinguishing systems shall be sufficiently sized to protect against all hazards venting through a common duct simultaneously.

**904.11.3.1 Ventilation system.** Commercial-type cooking equipment protected by an automatic carbon dioxide-extinguishing system shall be arranged to shut off the ventilation system upon activation.

**904.11.4 Special provisions for automatic sprinkler systems.** Automatic sprinkler systems protecting commercial-type cooking equipment shall be supplied from a separate, readily accessible, indicating-type control valve that is identified.

**904.11.4.1 Listed sprinklers.** Sprinklers used for the protection of fryers shall be listed for that application and installed in accordance with their listing.

**904.12 Water Spray Fixed System.** Water spray fixed systems shall be installed, maintained, periodically inspected and tested in accordance with *NFPA 15* and their listing.

## **SECTION 905 STANDPIPE SYSTEMS**

**905.1 General.** Standpipe systems shall be provided in new buildings and structures in accordance with this section. Fire hose threads used in connection with standpipe systems shall be compatible with connections used by the local fire department. The location of fire department hose connections shall be approved by the head of the fire department.

**905.2 Installation standards.** Standpipe systems shall be installed in accordance with this section and *NFPA 14*. Where *standpipe systems* are required by 780 CMR, such systems shall be automatic wet systems.

Exception 1. When approved by the head of the fire department, an automatic dry or semi-automatic dry *standpipe systems* shall be permitted in areas subject to freezing.

*Exception 2. A manual wet standpipe is permitted in buildings less than 70 feet in height which are equipped throughout with an approved automatic fire suppression system. However, the system may be designed to obtain the outlet pressures and water flows in accordance with NFPA 14 with inlet pressures at the fire department connection that are consistent with local fire department equipment.*

**905.3 Required installations.** Standpipe systems shall be installed where required by Sections



905.3.1 through 905.3.6 and in the locations indicated in Sections 905.4, 905.5 and 905.6. Standpipe systems are permitted to be combined with automatic sprinkler systems.

**Exception:** Standpipe systems are not required in Group R-3 occupancies as applicable in Section 101.2.

**905.3.1 Building height.** Class III automatic standpipe systems shall be installed throughout buildings where the floor level of the highest story is located more than 30 feet (9144 mm) above the lowest level of fire department vehicle access, or where the floor level of the lowest story is located more than 30 feet (9144 mm) below the highest level of fire department vehicle access.

**Exceptions:**

1. Class I manual standpipes are allowed in open parking garages where the highest floor is located not more than 150 feet (45 720 mm) above the lowest level of fire department vehicle access.
2. Class I manual dry standpipes are allowed in open parking garages that are subject to freezing temperatures, provided that the hose connections are located as required for Class II standpipes in accordance with Section 905.5.

**905.3.2 Group A.** Class I automatic wet standpipes shall be provided in nonsprinklered Group A buildings having an occupant load exceeding 1,000 persons.

**Exceptions:**

1. Open-air-seating spaces without enclosed spaces.
2. Class I automatic dry and semiautomatic dry standpipes or manual wet standpipes are allowed in buildings where the highest floor surface used for human occupancy is 75 feet (22 860 mm) or less above the lowest level of fire department vehicle access.

**905.3.3 Covered mall buildings.** Hose connections shall be provided at each of the following locations:

1. Within the mall at the entrance to each exit passageway or corridor.
2. At each floor-level landing within enclosed stairways opening directly on the mall.
3. At exterior public entrances to the mall.

**905.3.4 Stages.** Stages greater than 1,000 square feet in area (93 m<sup>2</sup>) shall be equipped with a Class III automatic wet standpipe system with 1.5-inch and 2.5-inch (38 mm and 64 mm) hose connections on each side of the stage. Where permitted by the head of the fire department, a Class I Standpipe may be installed.

**Exception:** Where the building or area is equipped throughout with an automatic sprinkler system, the hose connections are allowed to be supplied from the automatic sprinkler system and shall have a flow rate of not less than that required by *NFPA 14* for Class III standpipes.

**905.3.4.1 Hose and cabinet.** The 1.5-inch (38 mm) hose connections shall be equipped with sufficient lengths of 1.5-inch (38 mm) hose to provide fire protection for the stage area. Hose connections shall be equipped with an approved adjustable fog nozzle and be mounted in a cabinet or on a rack.

**905.3.5 Underground buildings.** Underground buildings shall be equipped throughout with a Class I automatic wet or manual wet standpipe system.

**905.3.6 Helistops and heliports.** Buildings with a helistop or heliport that are equipped with a standpipe shall extend the standpipe to the roof level on which the helistop or heliport is located such that all areas of the helistop or heliport are within 150 feet of a Class I standpipe outlet.

**905.3.7 High-piled Combustible Storage.** A class I automatic wet or manual standpipe system shall be provided in all exit passageways of areas containing high-piled combustible storage.

**905.3.8 Building Area.** A class I automatic wet or manual standpipe system shall be provided in all buildings where any portion of the building floor area is more than 400 feet of travel from the nearest point of fire department vehicle access – note that in this instance, vehicle access travel distance is actual distance measured along and/or around the building exterior and shall not be argued reduced by the addition of fire walls/party walls which otherwise would define individual buildings.

**905.3.9 Groups A-1 and A-2.** In Group A-1 and A-2 occupancies with occupant loads of more than 1,000, shall be equipped with a Class II standpipe system.

**905.4 Location of Class I standpipe hose connections.** Class I standpipe hose connections shall be provided in all of the following locations:

1. In every required stairway, a hose connection shall be provided for each floor level above or below grade. Unless otherwise required by the head of the fire department, hose connections shall be located at an intermediate floor level landing between floors.
2. On each side of the wall adjacent to the exit opening of a horizontal exit.
3. In every exit passageway at the entrance from the exit passageway to other areas of a building.
4. In covered mall buildings, adjacent to each exterior public entrance to the mall and adjacent to each entrance from an exit passageway or exit corridor to the mall.
5. Where the roof has a slope less than four units vertical in 12 units horizontal (33.3-percent slope), each standpipe shall be provided with a hose connection located either on the roof or at the highest landing of stairways with stair access to the roof. An additional hose connection shall be provided at the top of the most hydraulically remote standpipe for testing purposes.
6. The most remote portion of a nonsprinklered floor or story shall not be more than 150 feet (45 720 mm) from a hose connection or the most remote portion of a sprinklered floor or story is more than 200 feet (60 960 mm) from a hose connection, the head of the fire department is authorized to require that additional hose connections be provided in approved locations. *Where connections are provided outside of exit stairways, the locations shall be approved by the head of the fire department.*

**905.4.1 Protection.** Risers and laterals of Class I standpipe systems not located within an enclosed stairway or pressurized enclosure shall be protected by a degree of fire resistance equal to that required for vertical enclosures in the building in which they are located.

**Exception:** In buildings equipped throughout with an approved automatic sprinkler system, laterals that are not located within an enclosed stairway or pressurized enclosure are not required to be enclosed within fire-resistance-rated construction.

**905.4.2 Interconnection.** In buildings where more than one standpipe is provided, the standpipes shall be interconnected in accordance with *NFPA 14*.

**905.4.3 1.5" Reducer.** A removable 1.5" reducer and cap shall be provided on all Class I outlets.

**905.5 Location of Class II standpipe hose connections.** Class II standpipe hose connections shall be accessible and located so that all portions of the building are within 30 feet (9144 mm) of a nozzle attached to 100 feet (30 480 mm) of hose.

**905.5.1 Groups A-1 and A-2.** In Group A-1 and A-2 occupancies with occupant loads of more than 1,000, hose connections shall be located on each side of any stage, on each side of the rear of the auditorium, on each side of the balcony and on each tier of dressing rooms.

**905.5.2 Protection.** Fire-resistance-rated protection of risers and laterals of Class II standpipe systems is not required.

**905.5.3 Class II system 1-inch hose.** A minimum 1-inch (25 mm) hose shall be permitted to be used for hose stations in light-hazard occupancies where investigated and listed for this service and where approved by the building official.

**905.6 Location of Class III standpipe hose connections.** Class III standpipe systems shall have hose connections located as required for Class I standpipes in Section 905.4 and shall have Class II hose connections as required in Section 905.5.

**905.6.1 Protection.** Risers and laterals of Class III standpipe systems shall be protected as required for Class I systems in accordance with Section 905.4.1.

**905.6.2 Interconnection.** In buildings where more than one Class III standpipe is provided, the standpipes shall be interconnected at the bottom.

**905.7 Standpipe system piping sizes:** The riser piping, supply piping, and the water service piping shall be hydraulically sized in accordance with the provisions of NFPA-14 listed in *Chapter 35*.

**Exception:** The residual pressure(s) as noted in NFPA-14 are not required to be maintained in buildings less than 70 feet in height which are equipped throughout with an approved automatic fire suppression system. However the system shall be designed to accommodate the outlet pressures and water flows in accordance with NFPA 14 and inlet pressures consistent with local fire department equipment..

**905.8 High-rise buildings:** All buildings more than 70 feet in height above the mean grade shall have each floor supplied by a minimum of two combination standpipe/sprinkler risers installed in accordance with the requirements of NFPA-14, listed in *Chapter 35*.

**905.9 Cabinets.** Cabinets containing fire-fighting equipment such as standpipes, fire hoses, fire extinguishers or fire department valves shall not be blocked from use or obscured from view.

**905.9.1 Cabinet equipment identification.** Cabinets shall be identified in an approved manner by a permanently attached sign with letters not less than 2 inches (51 mm) high in a color that contrasts with the background color, indicating the equipment contained therein.

**Exceptions:**

1. Doors not large enough to accommodate a written sign shall be marked with a permanently attached pictogram of the equipment contained therein.
2. Doors that have either an approved visual identification clear glass panel or a complete glass door panel are not required to be marked.

**905.9.2 Locking cabinet doors.** Cabinets shall be unlocked.

**Exceptions:**

1. Visual identification panels of glass or other approved transparent frangible material that is easily broken and allows access.
2. Approved locking arrangements.
3. Group I-3.

**905.10 Valve supervision.** Valves controlling water supplies shall be supervised in the open position so that a change in the normal position of the valve will generate a supervisory signal at the supervising station required by Section 903.4. Where a fire alarm system is provided, a signal shall also be transmitted to the control unit.

**Exceptions:**

1. Valves to underground key or hub valves in roadway boxes provided by the municipality or public utility do not require supervision.
2. Valves locked in the normal position and inspected as provided in this code in buildings not equipped with a fire alarm system.

**905.11 During construction.** Standpipe systems required during construction and demolition operations shall be provided in accordance with Section 3311 and NFPA 241.

**SECTION 906 PORTABLE FIRE EXTINGUISHERS**

**906.1 General.** Portable fire extinguishers shall be provided in occupancies and locations as required by 527 CMR and 906.2.

**906.2 Where required:** A portable fire extinguisher shall be installed in the following locations in accordance with NFPA 10 listed in *Chapter 35*:

1. In all occupancies in Use Group A-1, A-2, A-3, B, E, I-2, M, R-1 or H;
2. In all areas containing commercial kitchen exhaust hood systems;

3. In all areas where fuel is dispensed;
4. In all areas where a *flammable* or *combustible liquid* is used in the operation of spraying, coating or dipping;
5. In all occupancies in Use Group I-3 at staff locations. Access to portable extinguishers shall be permitted to be locked;
6. On each completed floor of buildings under construction, other than occupancies in Use Group R-3.
7. In any laboratory, shop or other room occupied for similar purposes; and

**906.3 Approval:** Portable fire extinguishers shall bear the label of an *approved agency*, be of an approved type and be installed in a location visible and available to the occupants.

## **SECTION 907 FIRE ALARM AND DETECTION SYSTEMS**

**907.1 General.** This section covers the application, installation, performance and maintenance of fire alarm systems and their components.

### **907.1.1 Construction documents.**

**907.1.1.1** Construction documents required to accompany an application for a building permit shall include, but not be limited to, all of the following:

1. Narrative report
  - a. Basis (methodology) of design for the protection of the occupancy and hazards for compliance with 780 CMR and applicable NFPA standards, in the form of a narrative report.
  - b. Sequence of operation of all fire protection systems and operation in the form of a narrative report.
  - b. Testing criteria to be used for final system acceptance in the form of a narrative report.
2. ***Dedicated plans that*** indicate the use of all rooms and document the location of all fire alarm equipment and devices in accordance with NFPA 72. The sequences of operation shall appear on the fire alarm plans as well as the narrative report.
3. Fire alarm equipment and device symbol legend.
4. ***Primary power connection***
5. Details of ceiling height and construction.
6. The interface of fire safety control functions
7. The location of any equipment or devices that directly interface with the fire alarm system.
8. Fire alarm system riser diagram.

### **907.1.1.2 Construction documents required prior to the installation of fire alarm equipment or devices.** In addition to the documents shall be included but not be limited to:

1. Manufacturers, models numbers and listing information for equipment, devices and materials.
2. Circuitry layout, conductor types and sizes.
3. Voltage drop calculations
4. Battery calculations
5. Any amendments to the documents provided under section 907.1.1.1.

**907.1.1.3** Construction documents required prior to acceptance testing of fire alarm equipment or devices shall include but not be limited to:

1. as built plans

2. Input/output matrix
3. Any amendments to the documents provided under 907.1.1.1 and 907.1.1.2

**907.1.2 Equipment.** Systems and their components shall be listed or approved by a nationally recognized testing laboratory<sup>11</sup> for the purpose for which they are installed.

**907.2 Where required.** Manual, automatic or manual and automatic fire alarm system shall be provided in accordance with Sections 907.2.1 through 907.2.23. Where automatic sprinkler protection, installed in accordance with Section 903.3.1.1 or 903.3.1.2, is provided and connected to the building fire alarm system, automatic heat detection required by this section shall not be required. An automatic fire detection system shall be installed in accordance with the provisions of this code and *NFPA 72*. Devices, combinations of devices, appliances and equipment shall comply with Section 907.1.2. The automatic fire detectors shall be smoke detectors, except that an alternative type of detector shall be installed in spaces such as boiler rooms where, during normal operation, products of combustion are present in sufficient quantity to actuate a smoke detector.

**907.2.1 Group A.** A manual fire alarm system, consisting of a fire alarm control panel, manual fire alarm boxes (pull stations) and audible and visual alarm notification appliances shall be installed in accordance with *NFPA 72* in Group A occupancies having an occupant load of **50** or more. Portions of Group E occupancies occupied for assembly purposes shall be provided with a fire alarm system as required for the Group E occupancy.

**907.2.1.1 System initiation in Group A occupancies with an occupant load of 300 or more.** Activation of the fire alarm in Group A occupancies with an occupant load of 1,000 or more shall initiate a signal using an emergency voice/alarm communications system in accordance with *NFPA 72*.

Where the head of the fire department or his /her designee determines that partial or selective evacuation is not desired, but rather total evacuation is required, then a distinctive signal in lieu of a voice alarm is permitted.

**907.2.2 Group B.** A manual fire alarm system shall be installed in Group B occupancies having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge.

**907.2.3 Group E.** A manual and automatic fire alarm system with emergency voice/alarm capabilities in accordance with 907.2.12.2 shall be installed in Group E occupancies. When automatic sprinkler systems or smoke detectors are installed, such systems or detectors shall be connected to the building fire alarm system.

**Exceptions:**

1. Group E occupancies with an occupant load of less than 50.
2. Buildings equipped throughout with an automatic sprinkler system are not required to be equipped with an automatic fire detection system.

907.2.3.1 Where an automatic system is required the automatic detectors shall be smoke detectors. Coverage shall be in accordance with *NFPA 72*.

**907.2.4 Group F.** A manual fire alarm system shall be installed in Group F occupancies that are two or more stories in height and have an occupant load of 500 or more above or below the lowest level of exit discharge.

**907.2.5 Group H.** A manual fire alarm system shall be installed in Group H-5 occupancies and in occupancies used for the manufacture of organic coatings. An automatic smoke detection system shall be installed for highly toxic gases, organic peroxides and oxidizers.

**907.2.6 Group I.** A manual fire alarm system and an automatic fire detection system shall be installed in Group I occupancies. An automatic smoke detection system shall be provided in waiting areas that are open to corridors.

**Exception:** Manual fire alarm boxes in patient sleeping areas of Group I-1 and I-2 occupancies shall not be required at exits if located at all nurses' control stations or other constantly attended staff locations, provided such stations are visible and continuously accessible and that travel distances required in Section 907.3.1 are not exceeded.

**907.2.6.1 Group I-2.** Corridors in nursing homes (both intermediate-care and skilled nursing facilities), detoxification facilities and spaces open to the corridors shall be equipped with an automatic fire detection system.

**Exceptions:**

1. Corridor smoke detection is not required in smoke compartments that contain patient sleeping rooms where patient sleeping units are provided with smoke detectors that comply with UL 268. Such detectors shall provide a visual display on the corridor side of each patient sleeping unit and an audible and visual alarm at the nursing station attending each unit.

2. Corridor smoke detection is not required in smoke compartments that contain patient sleeping rooms where patient sleeping unit doors are equipped with automatic door-closing devices with integral smoke detectors on the unit sides installed in accordance with their listing, provided that the integral detectors perform the required alerting function.

**907.2.6.2 Group I-3.** Group I-3 occupancies shall be equipped with a manual and automatic fire alarm system installed for alerting staff.

**907.2.6.2.1 System initiation.** Actuation of an automatic fire-extinguishing system, a manual fire alarm box or a fire detector shall initiate an approved fire alarm signal which automatically notifies staff. Presignal systems shall not be used.

**907.2.6.2.2 Manual fire alarm boxes.** Manual fire alarm boxes are not required to be located in accordance with Section 907.3 where the fire alarm boxes are provided at staff-attended locations having direct supervision over areas where manual fire alarm boxes have been omitted. Manual fire alarm boxes shall be permitted to be locked in areas occupied by detainees, provided that staff members are present within the subject area and have keys readily available to operate the manual fire alarm boxes.

**907.2.6.2.3 Smoke detectors.** An approved automatic smoke detection system shall be installed throughout resident housing areas, including sleeping areas and contiguous day rooms, group

activity spaces and other common spaces normally accessible to residents.

**Exceptions:**

1. Other approved smoke detection arrangements providing equivalent protection including, but not limited to, placing detectors in exhaust ducts from cells or behind protective guards listed for the purpose are allowed when necessary to prevent damage or tampering.

**907.2.7 Group M.** A manual fire alarm system shall be installed in Group M occupancies having an occupant load of 500 or more persons or more than 100 persons above or below the lowest level of exit discharge.

**Exception:** Manual fire alarm boxes are not required if the building is equipped throughout with an automatic sprinkler system and the alarm notification appliances will activate upon sprinkler water flow.

**907.2.7.1 Occupant notification.** During times that the building is occupied, in lieu of the automatic activation of alarm notification appliances, the manual fire alarm system shall be allowed to activate an alarm signal at a constantly attended location from which evacuation instructions shall be initiated over an emergency voice/alarm communication system installed in accordance with Section 907.2.12.2. The emergency voice/alarm communication system shall be allowed to be used for other announcements, provided the manual fire alarm use takes precedence over any other use.

**907.2.8 Group R-1.** Fire alarm systems shall be installed in Group R-1 occupancies as required in Sections 907.2.8.1 through 907.2.8.3 and in accordance with Table 907, titled RESIDENTIAL FIRE PROTECTION REQUIREMENTS.

**TABLE 907 - HERE**

**907.2.8.1 Manual fire alarm system.** A manual fire alarm system shall be installed in Group R-1 occupancies.

**Exceptions:**

1. A manual fire alarm system is not required in buildings not over two stories in height where all individual guestrooms and contiguous attic and crawl spaces are separated from each other and public or common areas by at least 1-hour fire partitions and each individual guestroom has an exit directly to a public way, exit court or yard.

**907.2.8.2 Automatic fire alarm system.** An automatic fire alarm system shall be installed throughout all interior corridors serving guestrooms.

**Exception:** An automatic fire detection system is not required in buildings that do not have interior corridors serving guestrooms and each guestroom has a means of egress door opening directly to an exterior exit access that leads directly to an exit.

**907.2.8.3 Smoke alarms.** Smoke alarms shall be installed as required by Section 907.2.10. In buildings that are not equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the smoke alarms in guestrooms shall be connected to an emergency electrical system and shall be annunciated by guestroom at a constantly attended location from which the fire alarm system is capable of being manually



activated.

This section shall not preclude the installation of a fully addressable fire alarm system where system detectors and alarm notifications devices can perform the functions as required in section 907.2.10.

**907.2.9 Group R-2.** A manual fire alarm system and an automatic fire detection system shall be installed in Group R-2 occupancies and in accordance with Table 907.

Exception: A manual fire alarm system is not required in buildings with 12 or less dwelling units.

**907.2.10 Single- and multiple-station smoke alarms.** Listed single- and multiple-station photoelectric type smoke alarms shall be installed in accordance with the provisions of this code and the household fire-warning equipment provisions of *NFPA 72*.

**907.2.10.1 Where required.** Single- or multiple-station smoke alarms shall be installed in the locations described in Sections 907.2.10.1.1 through 907.2.10.1.4.

**907.2.10.1.1 Group R-1.** Single- or multiple-station smoke alarms shall be installed in all of the following locations in Group R-1:

1. In sleeping areas.
2. In every room in the path of the means of egress from the sleeping area to the door leading from the sleeping unit.
3. In each story within the sleeping unit, including basements. For sleeping units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

**907.2.10.1.2 Groups R-2, R-3, R-4 and I-1.** Single- or multiple-station smoke alarms shall be installed and maintained in Groups R-2, R-3, R-4 and I-1, regardless of occupant load at all of the following locations:

1. On the ceiling or wall outside of each separate sleeping area in the immediate vicinity of bedrooms.
2. In each room used for sleeping purposes.
3. In each story within a dwelling unit, including basements but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

**907.2.10.1.3 Group I-1.** Single- or multiple-station smoke alarms shall be installed and maintained in sleeping areas in occupancies in Group I-1. Single- or multiple-station smoke alarms shall not be required where the building is equipped throughout with an automatic fire detection system in accordance with Section 907.2.6.

**907.2.10.1.4 Other Sleeping Areas.** *Any area intended or used for sleeping purposes and occupants are capable of self-preservation.”*

**907.2.10.2 Power source.** In new construction, required smoke alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source and shall be equipped with a battery backup. Smoke alarms shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than as required for overcurrent protection.

**Exception:** Smoke alarms are not required to be equipped with battery backup in Group R-1 where they are connected to an emergency electrical system.

**907.2.10.3 Interconnection.** Where more than one smoke alarm is required to be installed within an individual dwelling unit in Group R-2, R-3 or R-4, or within an individual dwelling unit or sleeping unit in Group R-1, the smoke alarms shall be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

**907.2.10.4 Acceptance testing.** When the installation of the alarm devices is complete, each detector and interconnecting wiring for multiple-station alarm devices shall be tested in accordance with the household fire warning equipment provisions of *NFPA 72*.

**907.2.11 Special amusement buildings.** An approved automatic smoke detection system shall be provided in special amusement buildings in accordance with this section.

**Exception:** In areas where ambient conditions will cause a smoke detection system to alarm, an approved alternative type of automatic detector shall be installed.

**907.2.11.1 Alarm.** Activation of any single smoke detector, the automatic sprinkler system or any other automatic fire detection device shall immediately sound an alarm at the building at a constantly attended location from which emergency action can be initiated, including the capability of manual initiation of requirements in Section 907.2.11.2.

**907.2.11.2 System response.** The activation of two or more smoke detectors, a single smoke detector with alarm verification, the automatic sprinkler system or other approved fire detection device shall automatically:

1. Cause illumination of the means of egress with light of not less than 1 foot-candle (11 lux) at the walking surface level;
  2. Stop any conflicting or confusing sounds and visual distractions; and
  3. Activate an approved directional exit marking that will become apparent in an emergency.
- Such system response shall also include activation of a prerecorded message, clearly audible throughout the special amusement building, instructing patrons to proceed to the nearest exit. Alarm signals used in conjunction with the prerecorded message shall produce a sound which is distinctive from other sounds used during normal operation. The wiring to the auxiliary devices and equipment used to accomplish the above fire safety functions shall be monitored for integrity in accordance with *NFPA 72*.

**907.2.11.3 Emergency voice/alarm communication system.** An emergency voice/alarm

communication system, which is also allowed to serve as a public address system, shall be installed in accordance with *NFPA 72*, and shall be audible throughout the entire special amusement building.

**907.2.12 High-rise buildings.** Buildings having floors used for human occupancy located more than 70 feet above grade plane shall be provided with an automatic fire alarm system and an emergency voice/alarm communication system in accordance with Section 907.2.12.2. Note: Also see Section 403.

**Exceptions:**

1. Airport traffic control towers in accordance with Sections 412 and 907.2.22.
2. Open parking garages in accordance with Section 406.3.
3. Buildings with an occupancy in Group A-5.
4. Low-hazard special occupancies in accordance with Section 503.1.2.
5. Buildings with an occupancy in Group H-1, H-2 or H-3 in accordance with Section 415.

**907.2.12.1 Automatic fire detection.** Smoke detectors shall be provided in accordance with this section. Smoke detectors shall be connected to an automatic fire alarm system. The activation of any detector required by this section shall operate the emergency voice/alarm communication system. Smoke detectors shall be located as follows:

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room which is not provided with sprinkler protection, elevator machine rooms and in elevator lobbies.
2. In the main return air and exhaust air plenum of each air-conditioning system having a capacity greater than 2,000 cubic feet per minute (cfm) (0.94 m<sup>3</sup>/s). Such detectors shall be located in a serviceable area downstream of the last duct inlet.
3. At each connection to a vertical duct or riser serving two or more stories from a return air duct or plenum of an air-conditioning system. In Group R-1 and R-2 occupancies a listed smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm (2.4 m<sup>3</sup>/s) and serving not more than 10 air inlet openings.

**907.2.12.2 Emergency voice/alarm communication system.** The operation of any automatic fire detector, sprinkler water-flow device or manual fire alarm box shall automatically sound an alert tone followed by voice instructions giving approved information and directions on a general or selective basis to the following terminal areas on a minimum of the alarming floor, the floor above and the floor below:

1. Elevator lobbies.
2. Corridors.
3. Rooms and tenant spaces exceeding 1,000 square feet (93 m<sup>2</sup>) in area.
4. Dwelling units or sleeping units in Group R-2 occupancies.
5. Sleeping units in Group R-1 occupancies.
6. Areas of refuge as defined in Section 1002.

All habitable areas of use group E.

**Exception:** In Group I-1 and I-2 occupancies, the alarm shall sound in a constantly attended area and a general occupant notification shall be broadcast over the overhead page.

**907.2.12.2.1 Manual override.** A manual override for emergency voice communication shall be provided for all paging zones.

**907.2.12.2.2 Live voice messages.** The emergency voice/alarm communication system shall also have the capability to broadcast live voice messages through speakers located in elevators, exit stairways and throughout a selected floor or floors.

**907.2.12.2.3 Standard.** The emergency voice/alarm communication system shall be designed and installed in accordance with *NFPA 72*.

907.2.12.2.4 The sequence of operation of the voice alarm signaling system shall be as follows:

1. sound an alert (pre-signal) tone (the alert tone shall be a 900 hertz tone pulsed to produce one round of code 4 at approximately one second intervals.
2. Activate the recorded message regarding the evacuation procedure. The alarm and communications system shall provide a pre-recorded message to all required areas. The message shall contain the following information. *“attention please. The signal tone you have just heard indicated a report of an emergency in this building. If your floor evacuation signal sounds after this message, walk to the nearest stairway and leave the floor. While the report is being verified, occupants on other floors should await further instructions.”*

This message shall be transmitted Three times.

A female voice shall be used for this message.

3. Activate the evacuation signal on the floor of incident and the next floor above and below
- Exceptions: Alternatives to the requirements of this section when part of an approved fire safety and evacuation plan in accordance with 527 CMR 10.13

**907.2.12.3 Fire department communication system.** An approved two-way, fire department communication system designed and installed in accordance with *NFPA 72* shall be provided for fire department use. It shall operate between a fire command center complying with Section 911 and elevators, elevator lobbies, emergency and standby power rooms, fire pump rooms, areas of refuge and inside enclosed exit stairways. The fire department communication device shall be provided at each floor level within the enclosed stairway.

**Exception:** Fire department radio systems where approved by the fire department.

**907.2.13 Atriums connecting more than two stories.** A fire alarm system shall be installed in occupancies with an atrium that connects more than two stories. The system shall be activated in accordance with Section 907.7. Such occupancies in Group A, E or M shall be provided with an emergency voice/alarm communication system complying with the requirements of Section 907.2.12.2.

**907.2.14 High-piled combustible storage areas.** An automatic fire detection system shall be installed throughout high-piled combustible storage areas greater than 500 square feet.

**Exception:** Buildings protected throughout with automatic sprinklers.

**907.2.15 Delayed egress locks.** Where delayed egress locks are installed on means of egress doors in accordance with Section 1008.1.8.6, an automatic smoke or heat detection system shall be installed as required by that section.

**907.2.16 Aerosol storage uses.** *Aerosol storage rooms and general-purpose warehouses containing aerosols shall be provided with an approved manual fire alarm system where*

*required by the International Fire Code and 527 CMR.*

**907.2.17 Lumber, plywood and veneer mills.** Lumber, plywood and veneer mills shall be provided with a manual fire alarm system.

**907.2.18 Underground buildings with smoke exhaust system.** Where a smoke exhaust system is installed in an underground building in accordance with this code, automatic fire detectors shall be provided in accordance with this section.

**907.2.18.1 Smoke detectors.** A minimum of one smoke detector listed for the intended purpose shall be installed in the following areas:

1. Mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar rooms.
2. Elevator lobbies.
3. The main return and exhaust air plenum of each air-conditioning system serving more than one story and located in a serviceable area downstream of the last duct inlet.
4. Each connection to a vertical duct or riser serving two or more floors from return air ducts or plenums of heating, ventilating and air-conditioning systems, except that in Group R occupancies, a listed smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm (2.4 m<sup>3</sup>/s) and serving not more than 10 air inlet openings.

**907.2.18.2 Alarm required.** Activation of the smoke exhaust system shall activate an audible alarm at a constantly attended location and activate the alarm notification appliances throughout the building in accordance with 907.10.

**907.2.19 Underground buildings.** Where the lowest level of a structure is more than 60 feet (18 288 mm) below the lowest level of exit discharge, the structure shall be equipped throughout with a manual fire alarm system, including an emergency voice/alarm communication system installed in accordance with Section 907.2.12.2.

**907.2.19.1 Public address system.** Where a fire alarm system is not required by Section 907.2, a public address system shall be provided that shall be capable of transmitting voice communications to the highest level of exit discharge serving the underground portions of the structure and all levels below.

**907.2.20 Covered mall buildings.** Covered mall buildings exceeding 50,000 square feet (4645 m<sup>2</sup>) in total floor area shall be provided with an emergency voice/alarm communication system. An emergency voice/alarm communication system serving a mall, required or otherwise, shall be accessible to the fire department. The system shall be provided in accordance with Section 907.2.12.2.

**907.2.21 Residential aircraft hangars.** A minimum of one listed *heat detector* shall be installed within a residential aircraft hangar as defined in Section 412.3.1 and shall be interconnected into the residential smoke alarm or other sounding device to provide an alarm that will be audible in all sleeping areas of the dwelling.

**907.2.22 Airport traffic control towers.** An automatic fire detection system shall be provided

in airport traffic control towers.

**907.2.23 Battery rooms.** An approved automatic smoke detection system shall be installed in areas containing stationary lead-acid battery systems having a liquid capacity of more than 50 gallons (189.3 L). The detection system shall be supervised by an approved central, proprietary or remote station service or a local alarm that will sound an audible signal at a constantly attended location.

**907.2.24 Buildings with sleeping areas.** An automatic smoke detection system shall be provided for all sleeping areas, and means of egress from sleeping areas, of occupants not capable of self preservation in buildings not otherwise required to have smoke detectors by 780 CMR 907.2.1 through 780 CMR 907.2.23 where any space is used for sleeping purposes. Automatic smoke detection shall also be provided for sleeping areas where the occupants are not capable of self-preservation.”

**907.3 Manual fire alarm boxes.** Manual fire alarm boxes shall be installed in accordance with Sections 907.3.1 through 907.3.5.

**907.3.1 Location.** Manual fire alarm boxes shall be located not more than 5 feet (1524 mm) from the entrance to each exit. Additional manual fire alarm boxes shall be located so that travel distance to the nearest box does not exceed 200 feet (60 960 mm).

**907.3.2 Height.** The height of the manual fire alarm boxes shall be a minimum of 42 inches (1067 mm) and a maximum of 48 inches (1219 mm), measured vertically, from the floor level to the activating handle or lever of the box.

**907.3.3 Color.** Manual fire alarm boxes shall be red in color.

**907.3.4 Signs.** Where fire alarm systems are not monitored by a supervising station, an approved permanent sign that reads: WHEN ALARM SOUNDS—CALL FIRE DEPARTMENT shall be installed adjacent to each manual fire alarm box.

**Exception:** Where the manufacturer has permanently provided this information on the manual fire alarm box.

**907.3.5 Protective covers.** The building official *or fire official* is authorized to require the installation of listed manual fire alarm box protective covers to prevent malicious false alarms or provide the manual fire alarm box with protection from physical damage. The protective cover shall be transparent or red in color with a transparent face to permit visibility of the manual fire alarm box. Each cover shall include proper operating instructions. A protective cover that emits a local alarm signal shall not be installed unless approved.

**907.4 Power supply.** The primary and secondary power supplies for the fire alarm system shall be provided in accordance with *NFPA 72*.

**907.5 Wiring.** Wiring shall comply with the requirements of *527 CMR 12* and *NFPA 72*. Wireless protection systems utilizing radio-frequency transmitting devices shall comply with the

special requirements for supervision of low-power wireless systems in *NFPA 72*.

**907.6 Activation.** Where an alarm notification system is required by another section of this code, it shall be activated by:

1. A required automatic fire alarm system.
2. Sprinkler water-flow devices.
3. Required manual fire alarm boxes.
4. Other approved types of automatic fire detection devices, extinguishing, or suppression systems.

**907.7 Presignal system.** Presignal systems shall not be installed unless approved by the building official and the fire department. Where a presignal system is installed, 24-hour personnel supervision shall be provided at a location approved by the fire department, in order that the alarm signal can be actuated in the event of fire or other emergency.

**907.8 Zones.** Each floor shall be zoned separately and a zone shall not exceed 22,500 square feet (2090 m<sup>2</sup>). The length of any zone shall not exceed 300 feet (91 440 mm) in any direction.

**Exception:** Automatic sprinkler system zones shall not exceed the area permitted by *NFPA 13*.

**907.8.1 Zoning indicator panel.** A zoning indicator panel and the associated controls shall be provided in an approved location. The visual zone indication shall lock in until the system is reset and shall not be canceled by the operation of an audible alarm-silencing switch.

**907.8.2 High-rise buildings.** In buildings more than 70 feet in height above grade plane a separate zone by floor shall be provided for all of the following types of alarm-initiating devices where provided:

1. Smoke detectors.
2. Sprinkler water-flow devices.
3. Manual fire alarm boxes.
4. Other approved types of automatic fire detection devices or suppression systems.

**907.9 Alarm notification appliances.** Alarm notification appliances shall be provided and shall be listed for their purpose.

**907.9.1 Visible alarms.** Visible alarm notification appliances shall be provided in accordance with Sections 907.9.1.1 through 907.9.1.3 – also refer to 521 CMR requirements for visible alarms requirements in buildings or portions thereof, open to the public.

**Exceptions:**

1. Visible alarm notification appliances are not required in alterations, except where an existing fire alarm system is upgraded or replaced, or a new fire alarm system is installed (also refer to 521 CMR requirements for visible alarms requirements in buildings or portions thereof, open to the public).
2. Visible alarm notification appliances shall not be required in exits as defined in Section 1002.1 (also refer to 521 CMR requirements for visible alarms requirements in buildings or portions thereof, open to the public).

**907.9.1.1 Public and common areas.** Visible alarm notification appliances shall be provided in public areas and common areas (also refer to 521 CMR requirements for visible alarms requirements in buildings or portions thereof, open to the public).

**907.9.1.2 Employee work areas.** Where employee work areas have audible alarm coverage, the wiring systems shall be designed so that visible alarm notification appliances can be integrated into the alarm system.

**907.9.1.3 Groups I and R.** Refer to 521 CMR for requirements for visible alarms in Group I and R sleeping units – such visible alarm notification appliances shall be activated by both the in-room smoke alarm and the building fire alarm system.

**907.9.1.4 Group R-2.** In Group R-2 occupancies required by Section 907 to have a fire alarm system, all dwelling units and sleeping units shall be provided with the capability to support visible alarm notification appliances in accordance with *ICC A117.1*.

**907.9.2 Audible alarms.** Audible alarm notification appliances shall be provided and shall sound a distinctive sound that is not to be used for any purpose other than that of a fire alarm. The audible alarm notification appliances shall provide a sound pressure level in accordance with NFPA 72. Where the average ambient noise is greater than 105 dBA, visible alarm notification appliances shall be provided in accordance with *NFPA 72* and audible alarm notification appliances shall not be required.

**Exception:** Visible alarm notification appliances shall be allowed in lieu of audible alarm notification appliances in critical-care areas of Group I-2 occupancies.

**907.10 Fire safety functions.** Automatic fire detectors utilized for the purpose of performing fire safety functions shall be connected to the building's fire alarm control panel where a fire alarm system is required by Section 907.2. Detectors shall, upon actuation, perform the intended function and activate the alarm notification appliances and where provided a visible and audible supervisory signal at a constantly attended location. In buildings not required to be equipped with a fire alarm system, the automatic fire detector shall be powered by normal electrical service and, upon actuation, perform the intended function. The detectors shall be located in accordance with *NFPA 72*.

**907.11 Duct smoke detectors.** Duct smoke detectors shall be connected to the building's fire alarm control panel when a fire alarm system is provided. Activation of a duct smoke detector shall initiate a visible and audible supervisory signal at a constantly attended location. Duct smoke detectors shall not be used as a substitute for required open-area detection.

**Exceptions:**

1. The supervisory signal at a constantly attended location is not required where duct smoke detectors activate the building's alarm notification appliances.
2. In occupancies not required to be equipped with a fire alarm system, actuation of a smoke detector shall activate a visible and audible signal in an approved location. Smoke detector trouble conditions shall activate a visible or audible signal in an approved location and shall be identified as air duct detector trouble.



3. Duct smoke detectors may be used as a substitute for an open area protection in accordance 907.2.6.2.3

**907.12 Access.** Access shall be provided to each detector for periodic inspection, maintenance and testing.

**907.13 Fire-extinguishing systems.** Automatic fire-extinguishing systems shall be connected to the building fire alarm system where a fire alarm system is required by another section of this code or is otherwise installed.

**907.14 Supervising.**

**907.14.1 Re-transmission of alarm signals received by central stations and received by those operating approved remote station fire alarm system supervising stations.** In all cases, central stations and those operating approved remote station fire alarm system supervising stations shall re-transmit alarm signals within 90 seconds of receipt, to the fire department having jurisdiction.

**907.14.2 Fire suppression systems.** All automatic fire suppression systems required by 780 CMR shall be supervised by one of the following methods below.

1. A UL listed or FM approved Central Station Service in accordance with NFPA 72 listed in Chapter 35.

2. a. Approved propriety supervising station system, in accordance with NFPA 72 in accordance with NFPA 72 as listed in Chapter 35.

2.b. Approved remote station fire alarm system supervising station in accordance with NFPA 72 as listed in Chapter 35.

3. Alarm signals to an approved Auxiliary Fire Alarm System in accordance with NFPA 72, with supervisory signals supervised by one or two above or at a constantly attended location approved by the local fire department, having personnel on duty trained to recognize the type of signal received and to take prescribed action. This shall be permitted to be a location different from that at which alarm signals are received.

Exceptions:

1. Underground gate valves with roadway boxes.

2. Halogenated extinguishing systems that are not an integral part of a required automatic fire suppression system.

3. Carbon dioxide extinguishing systems that are not an integral part of a required automatic fire suppression system.

4. Dry- and wet- chemical extinguishing systems

5. Limited area sprinkler systems (see 780 CMR 903.3.5.1.1)

6 Occupancies in use group R containing less than 13 dwelling units, no more than 4 stories in height and equipped with a suppression system conforming to NFPA and supervised in accordance with NFPA 13R listed in Chapter 35.

**907.14.3 Fire protective signaling systems and automatic fire detection systems.** All fire protective signaling systems and automatic fire detection systems required by 780 CMR shall be supervised by one of the following methods below:

1. A UL listed or FM approved Central Station Service in accordance with NFPA 72 as listed Chapter 35.
2. a. Approved propriety supervising station system, in accordance with NFPA 72 in accordance with NFPA 72 as listed in Chapter 35.
- 2.b. Approved remote station fire alarm system supervising station in accordance with NFPA 72 as listed in Chapter 35.
3. Alarm signals to an approved Auxiliary Fire Alarm System in accordance with NFPA 72, with supervisory signals supervised by one or two above or at a constantly attended location approved by the local fire department, having personnel on duty trained to recognize the type of signal received and to take prescribed action. This shall be permitted to be a location different from that at which alarm signals are received.

Exceptions:

1. For use group R see Table 907
2. Single- and multi-station detectors as required by 780 CMR 5303.13
3. Smoke detectors in occupancies in use group I-3.
4. Smoke detectors in patient sleeping rooms in occupancies in Use Group I-2 (see 780 CMR 407.6).

**907.14.4 Group H.** Emergency alarm systems in Group H occupancies shall be monitored by an approved supervising station.

**Exception:** When approved by the Head of the Fire Department, on-site monitoring at a constantly attended location shall be permitted provided that notifications to the fire department will be equal to those provided by an approved supervising station.

**907.15 Automatic telephone-dialing devices.** Automatic telephone-dialing devices used to transmit an emergency alarm shall not be connected to any fire department telephone number unless approved by the fire chief.

**907.16 Acceptance tests.** Upon completion of the installation of the fire alarm system, alarm notification appliances and circuits, alarm-initiating devices and circuits, supervisory-signal initiating devices and circuits, signaling line circuits, and primary and secondary power supplies shall be tested in accordance with *NFPA 72*.

**907.17 Record of completion.** A record of completion in accordance with *NFPA 72* verifying that the system has been installed in accordance with the approved plans and specifications shall be provided.

**907.18 Instructions.** Operating, testing and maintenance instructions, and record drawings (“as built”) and equipment specifications shall be provided at an approved location.

**907.19 Inspection, testing and maintenance.** The maintenance and testing schedules and procedures for fire alarm and fire detection systems shall be in accordance with *NFPA 72*.

## **SECTION 908 EMERGENCY ALARM SYSTEMS**

**908.1 Group H occupancies.** Emergency alarms for the detection and notification of an

emergency condition in Group H occupancies shall be provided in accordance with Section 414.7.

**908.2 Group H-5 occupancy.** Emergency alarms for notification of an emergency condition in an HPM facility shall be provided as required in Section 415.9.4.6. A continuous gas-detection system shall be provided for HPM gases in accordance with Section 415.9.7.

**908.3 Highly toxic and toxic materials.** A gas detection system shall be provided for indoor storage and use of highly toxic and toxic gases to detect the presence of gas at or below the permissible exposure limit (PEL) or ceiling limit of the gas for which detection is provided. The system shall be capable of monitoring the discharge from the treatment system at or below one-half the IDLH limit.

**Exception:** A gas detection system is not required for toxic gases when the physiological warning properties are at a level below the accepted PEL for the gas.

**908.3.1 Alarms.** The gas detection system shall initiate a local alarm and transmit a signal to a constantly attended control station when a short-term hazard condition is detected. The alarm shall be both visible and audible and shall provide warning both inside and outside the area where gas is detected. The audible alarm shall be distinct from all other alarms.

**Exception:** Signal transmission to a constantly attended control station is not required when not more than one cylinder of highly toxic or toxic gas is stored.

**908.3.2 Shutoff of gas supply.** The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for whichever gas is detected.

**Exception:** Automatic shutdown is not required for reactors utilized for the production of highly toxic or toxic compressed gases where such reactors are:

1. Operated at pressures less than 15 pounds per square inch gauge (psig) (103.4 kPa).
2. Constantly attended.
3. Provided with readily accessible emergency shutoff valves.

**908.3.3 Valve closure.** The automatic closure of shutoff valves shall be in accordance with the following:

1. When the gas-detection sampling point initiating the gas detection system alarm is within a gas cabinet or exhausted enclosure, the shutoff valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.
2. Where the gas-detection sampling point initiating the gas detection system alarm is within a gas room and compressed gas containers are not in gas cabinets or exhausted enclosures, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas-detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve for the compressed container of specific gas detected supplying the manifold shall automatically close.

**Exception:** When the gas-detection sampling point initiating the gas-detection system alarm is at a use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve in the gas valve enclosure for the branch line located in the piping distribution manifold enclosure shall automatically close.

**908.4 Ozone gas-generator rooms.** Ozone gas-generator rooms shall be equipped with a continuous gas-detection system that will shut off the generator and sound a local alarm when concentrations above the PEL occur.

**908.5 Repair garages.** A flammable-gas detection system shall be provided in repair garages for vehicles fueled by nonodorized gases in accordance with Section 406.6.6.

**908.6 Refrigerant detector.** Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values for the refrigerant classification indicated in the *International Mechanical Code*. Detectors and alarms shall be placed in approved locations.

**Exception:** Detectors are not required in ammonia system machinery rooms equipped with a vapor detector in accordance with the *International Mechanical Code*.

## **SECTION 909 SMOKE CONTROL SYSTEMS**

**909.1 Scope and purpose.** This section applies to mechanical or passive smoke control systems when they are required by other provisions of this code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section serve a different purpose than the smoke- and heat-venting provisions found in Section 910. Mechanical smoke control systems shall not be considered exhaust systems under Chapter 5 of the *International Mechanical Code*.

**909.2 General design requirements.** Buildings, structures or parts thereof required by this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design. The construction documents shall include sufficient information and detail to adequately describe the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied by sufficient information and analysis to demonstrate compliance with these provisions.

**909.3 Special inspection and test requirements.** In addition to the ordinary inspection and test requirements which buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the construction documents shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved. The special inspections and tests required by this section shall be conducted under the same terms in Section 1704.

**909.4 Analysis.** A rational analysis supporting the types of smoke control systems to be employed, their methods of operation, the systems supporting them and the methods of construction to be utilized shall accompany the submitted construction documents and shall include, but not be limited to, the items indicated in Sections 909.4.1 through 909.4.6.

**909.4.1 Stack effect.** The system shall be designed such that the maximum probable normal or reverse stack effect will not adversely interfere with the system's capabilities. In determining the maximum probable stack effect, altitude, elevation, weather history and interior temperatures shall be used.

**909.4.2 Temperature effect of fire.** Buoyancy and expansion caused by the design fire in accordance with Section 909.9 shall be analyzed. The system shall be designed such that these effects do not adversely interfere with the system's capabilities.

**909.4.3 Wind effect.** The design shall consider the adverse effects of wind. Such consideration shall be consistent with the wind-loading provisions of Chapter 16.

**909.4.4 HVAC systems.** The design shall consider the effects of the heating, ventilating and air-conditioning (HVAC) systems on both smoke and fire transport. The analysis shall include all permutations of systems status. The design shall consider the effects of the fire on the HVAC systems.

**909.4.5 Climate.** The design shall consider the effects of low temperatures on systems, property and occupants. Air inlets and exhausts shall be located so as to prevent snow or ice blockage.

**909.4.6 Duration of operation.** All portions of active or passive smoke control systems shall be capable of continued operation after detection of the fire event for not less than 20 minutes.

**909.5 Smoke barrier construction.** Smoke barriers shall comply with Section 709, and shall be constructed and sealed to limit leakage areas exclusive of protected openings. The maximum allowable leakage area shall be the aggregate area calculated using the following leakage area ratios:

1. Walls:  $A/A_w = 0.00100$
2. Exit enclosures:  $A/A_w = 0.00035$
3. All other shafts:  $A/A_w = 0.00150$
4. Floors and roofs:  $A/A_F = 0.00050$

where:

$A$  = Total leakage area, square feet ( $m^2$ ).

$A_F$  = Unit floor or roof area of barrier, square feet ( $m^2$ ).

$A_w$  = Unit wall area of barrier, square feet ( $m^2$ ).

The leakage area ratios shown do not include openings due to doors, operable windows or similar gaps. These shall be included in calculating the total leakage area.

**909.5.1 Leakage area.** The total leakage area of the barrier is the product of the smoke barrier gross area monitored by the allowable leakage area ratio, plus the area of other openings such as

gaps and operable windows. Compliance shall be determined by achieving the minimum air pressure difference across the barrier with the system in the smoke control mode for mechanical smoke control systems. Passive smoke control systems shall be tested using approved methods such as door fan testing.

**909.5.2 Opening protection.** Openings in smoke barriers shall be protected by automatic-closing devices actuated by the required controls for the mechanical smoke control system. Door openings shall be protected by fire door assemblies complying with Section 715.3.3.

**Exceptions:**

1. Passive smoke control systems with automatic-closing devices actuated by spot-type smoke detectors listed for releasing service installed in accordance with Section 907.10.
2. Fixed openings between smoke zones which are protected utilizing the airflow method.
3. In Group I-2, where such doors are installed across corridors, a pair of opposite-swinging doors without a center mullion shall be installed having vision panels with approved fire-rated glazing materials in approved fire-rated frames, the area of which shall not exceed that tested. The doors shall be close fitting within operational tolerances and shall not have undercuts, louvers or grilles. The doors shall have head and jamb stops, astragals or rabbets at meeting edges, and automatic-closing devices. Positive-latching devices are not required.
4. Group I-3.
5. Openings between smoke zones with clear ceiling heights of 14 feet (4267 mm) or greater and bank-down capacity of greater than 20 minutes as determined by the design fire size.

**909.5.2.1 Ducts and air transfer openings.** Ducts and air transfer openings are required to be protected with a minimum Class II, 250°F (121°C) smoke damper complying with Section 716.

**909.6 Pressurization method.** The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers. Maintenance of a tenable environment is not required in the smoke control zone of fire origin.

**909.6.1 Minimum pressure difference.** The minimum pressure difference across a smoke barrier shall be 0.05-inch water gage (0.0124 kPa) in fully sprinklered buildings. In buildings permitted to be other than fully sprinklered, the smoke control system shall be designed to achieve pressure differences at least two times the maximum calculated pressure difference produced by the design fire.

**909.6.2 Maximum pressure difference.** The maximum air pressure difference across a smoke barrier shall be determined by required door-opening or closing forces. The actual force required to open exit doors when the system is in the smoke control mode shall be in accordance with Section 1008.1.2. Opening and closing forces for other doors shall be determined by standard engineering methods for the resolution of forces and reactions. The calculated force to set a side-hinged, swinging door in motion shall be determined by:

$$F = F_{dc} + K(WADP)/2(W - d) \text{ (Equation 9-1)}$$

where:

A= Door area, square feet (m<sup>2</sup>).

d= Distance from door handle to latch edge of door, feet (m).

F= Total door opening force, pounds (N).

$F_{dc}$ = Force required to overcome closing device, pounds (N).  
 $K$ = Coefficient 5.2 (1.0).  
 $W$ = Door width, feet (m).  
 $DP$ = Design pressure difference, inches of water (Pa).

**909.7 Airflow design method.** Smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted. The design airflow shall be in accordance with this section. Airflow shall be directed to limit smoke migration from the fire zone. The geometry of openings shall be considered to prevent flow reversal from turbulent effects.

**909.7.1 Velocity.** The minimum average velocity through a fixed opening shall not be less than:  
 $v = 217.2 [h (T_f - T_o)/(T_f + 460)]^{1/2}$  (Equation 9-2)

For SI:  $v = 119.9[h (T_f - T_o)/T_f]^{1/2}$

where:

$h$ = Height of opening, feet (m).  
 $T_f$ = Temperature of smoke, °F (°K).  
 $T_o$ = Temperature of ambient air, °F (°K).  
 $v$ = Air velocity, feet per minute (m/minute).

**909.7.2 Prohibited conditions.** This method shall not be employed where either the quantity of air or the velocity of the airflow will adversely affect other portions of the smoke control system, unduly intensify the fire, disrupt plume dynamics or interfere with exiting. In no case shall airflow toward the fire exceed 200 feet per minute (1.02 m/s). Where the formula in Section 909.7.1 requires airflow to exceed this limit, the airflow method shall not be used.

**909.8 Exhaust method.** Mechanical smoke control for large enclosed volumes, such as in atriums or malls, shall be permitted to utilize the exhaust method. The design exhaust volumes shall be in accordance with this section.

**909.8.1 Exhaust rate.** The height of the lowest horizontal surface of the accumulating smoke layer shall be maintained at least 10 feet (3048 mm) above any walking surface which forms a portion of a required egress system within the smoke zone. The required exhaust rate for the zone shall be the largest of the calculated plume mass flow rates for the possible plume configurations. Provisions shall be made for natural or mechanical supply of air from outside or adjacent smoke zones to make up for the air exhausted. Makeup airflow rates, when measured at the potential fire location, shall not exceed 200 feet per minute (60 960 mm per minute) toward the fire. The temperature of the makeup air shall be such that it does not expose temperature-sensitive fire protection systems beyond their limits.

**909.8.2 Axisymmetric plumes.** The plume mass flow rate ( $m_p$ ), in pounds per second (kg/s), shall be determined by placing the design fire center on the axis of the space being analyzed. The limiting flame height shall be determined by:

$$z_l = 0.533 Q_c^{2/5} \text{ (Equation 9-3)}$$

For SI:  $z_l = 0.166Q_c^{2/5}$

where:

$m_p$  = Plume mass flow rate, pounds per second (kg/s).

$Q$  = Total heat output.

$Q_c$  = Convective heat output, British thermal units per second (kW). (The value of  $Q_c$  shall not be taken as less than  $0.70Q$ ).

$z$  = Height from top of fuel surface to bottom of smoke layer, feet (m).

$z_l$  = Limiting flame height, feet (m). The  $z_l$  value must be greater than the fuel equivalent diameter (see Section 909.9).

for  $z > z_l$

$$m_p = 0.022Q_c^{1/3}z^{5/3} + 0.0042Q_c$$

For SI:  $m_p = 0.071 Q_c^{1/3} z^{5/3} + 0.0018Q_c$

for  $z = z_l$

$$m_p = 0.011 Q_c$$

For SI:  $m_p = 0.035Q_c$

for  $z < z_l$

$$m_p = 0.0208Q_c^{3/5}z$$

For SI:  $m_p = 0.032Q_c^{3/5}z$

To convert  $m_p$  from pounds per second of mass flow to a volumetric rate, the following equation shall be used:

$$V = 60 m_p / \rho \text{ (Equation 9-4)}$$

where:

$V$  = Volumetric flow rate, cubic feet per minute ( $m^3/s$ ).

$\rho$  = Density of air at the temperature of the smoke layer, pounds per cubic feet ( $T$ : in °F) [ $kg/m^3$  ( $T$ : in °C)].

**909.8.3 Balcony spill plumes.** The plume mass flow rate ( $m_p$ ) for spill plumes shall be determined using the geometrically probable width based on architectural elements and projections in the following equation:

$$m_p = 0.124(QW^2)^{1/3}(z_b + 0.25H) \text{ (Equation 9-5)}$$

For SI:  $m_p = 0.36(QW^2)^{1/3}(z_b + 0.25H)$

where:

$H$  = Height above fire to underside of balcony, feet (m).

$m_p$  = Plume mass flow rate, pounds per second (kg/s).

$Q$  = Total heat output.

$W$  = Plume width at point of spill, feet (m).

$z_b$  = Height from balcony, feet (m).

**909.8.4 Window plumes.** The plume mass flow rate ( $m_p$ ) shall be determined from:

$$m_p = 0.077(A_w H_w^{1/2})^{1/3}(z_w + a)^{5/3} + 0.18A_w H_w^{1/2} \text{ (Equation 9-6)}$$

For SI:  $m_p = 0.68(A_w H_w^{1/2})^{1/3}(z_w + a)^{5/3} + 1.5A_w H_w^{1/2}$



where:

$A_w$  = Area of the opening, square feet ( $m^2$ ).

$H_w$  = Height of the opening, feet (m).

$m_p$  = plume mass flow rate, pounds per second (kg/s).

$z_w$  = Height from the top of the window or opening to the bottom of the smoke layer, feet (m).

$$a = 2.4A_w^{2/5} H_w^{1/5} - 2.1H_w.$$

**909.8.5 Plume contact with walls.** When a plume contacts one or more of the surrounding walls, the mass flow rate shall be adjusted for the reduced entrainment resulting from the contact provided that the contact remains constant. Use of this provision requires calculation of the plume diameter, that shall be calculated by:

$$d = 0.48 [(T_c + 460)/(T_a + 460)]^{1/2} z \text{ (Equation 9-7)}$$

For SI:  $d = 0.48 (T_c/T_a)^{1/2} z$

where:

$d$  = Plume diameter, feet (m).

$T_a$  = Ambient air temperature, °F (°K).

$T_c$  = Plume centerline temperature, °F (°K).

$$= 0.60 (T_a + 460) Q_c^{2/3} z^{-5/3} + T_a$$

$z$  = Height at which  $T_c$  is determined, feet (m).

For SI:  $T_c = 0.08 T_a Q_c^{2/3} z^{-5/3} + T_a$

**909.9 Design fire.** The design fire shall be based on a  $Q$  of not less than 5,000 Btu/s (5275 kW) unless a rational analysis is performed by the registered design professional. The design fire shall be based on the analysis in accordance with Section 909.4 and this section.

**909.9.1 Factors considered.** The engineering analysis shall include the characteristics of the fuel, fuel load, effects included by the fire and whether the fire is likely to be steady or unsteady.

**909.9.2 Separation distance.** Determination of the design fire shall include consideration of the type of fuel, fuel spacing and configuration. The ratio of the separation distance to the fuel equivalent radius shall not be less than 4. The fuel equivalent radius shall be the radius of a circle of equal area to floor area of the fuel package. The design fire shall be increased if other combustibles are within the separation distance as determined by:

$$R = [Q/(12pq)]^{1/2} \text{ (Equation 9-8)}$$

where:

$q$  = Incident radiant heat flux required for nonpiloted ignition, Btu/ft<sup>2</sup> s (W/m<sup>2</sup>).

$Q$  = Heat release from fire, Btu/s (kW).

$R$  = Separation distance from target to center of fuel package, feet (m).

**909.9.3 Heat-release assumptions.** The analysis shall make use of best available data from approved sources and shall not be based on excessively stringent limitations of combustible material.

**909.9.4 Sprinkler effectiveness assumptions.** A documented engineering analysis shall be provided for conditions that assume fire growth is halted at the time of sprinkler activation.

**909.10 Equipment.** Equipment such as, but not limited to, fans, ducts, automatic dampers and balance dampers, shall be suitable for its intended use, suitable for the probable exposure temperatures that the rational analysis indicates.

**909.10.1 Exhaust fans.** Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. This temperature rise shall be computed by:

$$T_s = (Q_c/mc) + (T_a) \text{ (Equation 9-9)}$$

where:

$c$ = Specific heat of smoke at smoke layer temperature, Btu/lb°F (kJ/kg · K).

$m$ = Exhaust rate, pounds per second (kg/s).

$Q_c$ = Convective heat output of fire, Btu/s (kW).

$T_a$ = Ambient temperature, °F (°K).

$T_s$ = Smoke temperature, °F (°K).

**Exception:** Reduced  $T_s$  as calculated based on the assurance of adequate dilution air.

**909.10.2 Ducts.** Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Section 909.10.1. Ducts shall be constructed and supported in accordance with the *International Mechanical Code*. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports.

**Exception:** Flexible connections (for the purpose of vibration isolation) complying with the *International Mechanical Code*, that are constructed of approved fire-resistance-rated materials.

**909.10.3 Equipment, inlets and outlets.** Equipment shall be located so as to not expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be so located as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.

**909.10.4 Automatic dampers.** Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall be listed and conform to the requirements of approved, recognized standards.

**909.10.5 Fans.** In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty, with the minimum number of belts being two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer's fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the requirements of Chapter 16. Motors driving fans shall not be operated

beyond their nameplate horsepower (kilowatts), as determined from measurement of actual current draw, and shall have a minimum service factor of 1.15.

**909.11 Power systems.** The smoke control system shall be supplied with two sources of power. Primary power shall be the normal building power systems. Secondary power shall be from an approved standby source complying with 527 CMR 12 as listed in Chapter 35. The standby power source and its transfer switches shall be in a separate room from the normal power transformers and switch gear and shall be enclosed in a room constructed of not less than 1-hour fire-resistance-rated fire barriers ventilated directly to and from the exterior. Power distribution from the two sources shall be by independent routes. Transfer to full standby power shall be automatic and within 60 seconds of failure of the primary power. The systems shall comply with 527 CMR 12 as listed in Chapter 35.

**909.11.1 Power sources and power surges.** Elements of the smoke management system relying on volatile memories or the like shall be supplied with uninterruptable power sources of sufficient duration to span a 15-minute primary power interruption. Elements of the smoke management system susceptible to power surges shall be suitably protected by conditioners, suppressors or other approved means.

**909.12 Detection and control systems.** Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 907. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control equipment. Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override, the presence of power downstream of all disconnects and, through a preprogrammed weekly test sequence report, abnormal conditions audibly, visually and by printed report.

**909.12.1 Wiring.** In addition to meeting requirements of 527 CMR as listed in Chapter 35; all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.

**909.12.2 Activation.** Smoke control systems shall be activated in accordance with this section.

**909.12.2.1 Pressurization, airflow or exhaust method.** Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.

**909.12.2.2 Passive method.** Passive smoke control systems actuated by approved spot-type detectors listed for releasing service shall be permitted.

**909.12.3 Automatic control.** Where completely automatic control is required or used, the automatic-control sequences shall be initiated from an appropriately zoned automatic sprinkler system complying with Section 903.3.1.1, manual controls that are readily accessible to the fire department and any smoke detectors required by engineering analysis.

**909.13 Control air tubing.** Control air tubing shall be of sufficient size to meet the required response times. Tubing shall be flushed clean and dry prior to final connections and shall be

adequately supported and protected from damage. Tubing passing through concrete or masonry shall be sleeved and protected from abrasion and electrolytic action.

**909.13.1 Materials.** Control air tubing shall be hard drawn copper, Type L, ACR in accordance with *ASTM B 42*, *ASTM B 43*, *ASTM B 68*, *ASTM B 88*, *ASTM B 251* and *ASTM B 280*. Fittings shall be wrought copper or brass, solder type, in accordance with *ASME B 16.18* or *ASME B 16.22*. Changes in direction shall be made with appropriate tool bends. Brass compression-type fittings shall be used at final connection to devices; other joints shall be brazed using a BCuP5 brazing alloy with solidus above 1,100°F (593°C) and liquids below 1,500°F (816°C). Brazing flux shall be used on copper-to-brass joints only.

**Exception:** Nonmetallic tubing used within control panels and at the final connection to devices, provided that all of the following conditions are met:

1. Tubing shall be listed by an approved agency for flame and smoke characteristics.
2. Tubing and connected devices shall be completely enclosed within galvanized or paint-grade steel enclosure of not less than 0.030 inch (0.76 mm) (No. 22 galvanized sheet gage) thickness. Entry to the enclosure shall be by copper tubing with a protective grommet of neoprene or teflon or by suitable brass compression to male-barbed adapter.
3. Tubing shall be identified by appropriately documented coding.
4. Tubing shall be neatly tied and supported within enclosure. Tubing bridging cabinet and door or moveable device shall be of sufficient length to avoid tension and excessive stress. Tubing shall be protected against abrasion. Tubing serving devices on doors shall be fastened along hinges.

**909.13.2 Isolation from other functions.** Control tubing serving other than smoke control functions shall be isolated by automatic isolation valves or shall be an independent system.

**909.13.3 Testing.** Control air tubing shall be tested at three times the operating pressure for not less than 30 minutes without any noticeable loss in gauge pressure prior to final connection to devices.

**909.14 Marking and identification.** The detection and control systems shall be clearly marked at all junctions, accesses and terminations.

**909.15 Control diagrams.** Identical control diagrams showing all devices in the system and identifying their location and function shall be kept on site readily accessible for inspection by the building and fire official. The format and manner of the control diagrams shall be subject to approval by the fire official.

**909.16 Fire-fighter's smoke control panel.** A fire-fighter's smoke control panel for fire department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems. The panel shall be located in a location approved by the fire department and the panel shall comply with sections 909.16.1 through 909.16.3. In buildings provided with a fire command center, the smoke control panel shall be located within the fire command center complying with Section 911.

**909.16.1 Smoke control systems.** Fans used or intended for smoke control purposes shall be shown on the fire-fighter's control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for all smoke control equipment, annunciated by fan and zone, and by pilot-lamp-type indicators as follows:

1. Fans, dampers and other operating equipment in their normal status—WHITE.
2. Fans, dampers and other operating equipment in their off or closed status—RED.
3. Fans, dampers and other operating equipment in their on or open status—GREEN.
4. Fans, dampers and other operating equipment in a fault status—YELLOW/AMBER.

**909.16.2 Smoke control panel.** The fire-fighter's control panel shall provide control capability over the complete smoke-control system equipment within the building as follows:

1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can also be controlled from other sources within the building. This may include stairway pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans and other operating equipment used or intended for smoke control purposes.
2. OPEN-AUTO-CLOSE control over individual dampers relating to smoke control and that are also controlled from other sources within the building.
3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the fire-fighter's control panel.

**Exceptions:**

1. Complex systems, where approved, where the controls and indicators are combined to control and indicate all elements of a single smoke zone as a unit.
2. Complex systems, where approved, where the control is accomplished by computer interface using approved, plain English commands.

**909.16.3 Control action and priorities.** The fire-fighter's control panel actions shall be as follows:

1. ON-OFF, OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the fire-fighter's control panel, no automatic or manual control from any other control point within the building shall contradict the control action. Where automatic means are provided to interrupt normal, non emergency equipment operation or produce a specific result to safeguard the building or equipment (i.e., duct freeze stats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices), such means shall be capable of being overridden by the fire-fighter's control panel. The last control action as indicated by each fire-fighter's control panel switch position shall prevail. In no case shall control actions require the smoke control system to assume more than one configuration at any one time.

**Exception:** Power disconnects required by 527 CMR 12 as listed in Chapter 35.

2. Only the AUTO position of each three-position fire-fighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, non emergency, building control position. Where a fire-fighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described above. When directed by an automatic signal to assume an emergency condition, the NORMAL position shall become the emergency condition for that device or group of devices within the zone. In no case shall control actions

require the smoke control system to assume more than one configuration at any one time.

**909.17 System response time.** Smoke-control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (such as dampers and fans) in the sequence necessary to prevent physical damage to the fans, dampers, ducts and other equipment. For purposes of smoke control, the fire-fighter's control panel response time shall be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shutdown of operating equipment and smoke control system startup, shall allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition. The system response time for each component and their sequential relationships shall be detailed in the required rational analysis and verification of their installed condition reported in the required final report.

**909.18 Acceptance testing.** Devices, equipment, components and sequences shall be individually tested. These tests, in addition to those required by other provisions of this code, shall consist of determination of function, sequence and, where applicable, capacity of their installed condition.

**909.18.1 Detection devices.** Smoke or fire detectors that are a part of a smoke control system shall be tested in accordance with Chapter 9 in their installed condition. When applicable, this testing shall include verification of airflow in both minimum and maximum conditions.

**909.18.2 Ducts.** Ducts that are part of a smoke control system shall be traversed using generally accepted practices to determine actual air quantities.

**909.18.3 Dampers.** Dampers shall be tested for function in their installed condition.

**909.18.4 Inlets and outlets.** Inlets and outlets shall be read using generally accepted practices to determine air quantities.

**909.18.5 Fans.** Fans shall be examined for correct rotation. Measurements of voltage, amperage, revolutions per minute (rpm) and belt tension shall be made.

**909.18.6 Smoke barriers.** Measurements using inclined manometers or other approved calibrated measuring devices shall be made of the pressure differences across smoke barriers. Such measurements shall be conducted for each possible smoke control condition.

**909.18.7 Controls.** Each smoke zone, equipped with an automatic-initiation device, shall be put into operation by the actuation of one such device. Each additional device within the zone shall be verified to cause the same sequence without requiring the operation of fan motors in order to prevent damage. Control sequences shall be verified throughout the system, including verification of override from the fire-fighter's control panel and simulation of standby power conditions.

**909.18.8 Special inspections for smoke control.** Smoke control systems shall be tested by a

special inspector.

**909.18.8.1 Scope of testing.** Special inspections shall be conducted in accordance with the following:

1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.
2. Prior to occupancy and after sufficient completion for the purposes of pressure-difference testing, flow measurements, and detection and control verification.

**909.18.8.2 Qualifications.** Special inspection agencies for smoke control shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.

**909.18.8.3 Reports.** A complete report of testing shall be prepared by the special inspector or special inspection agency. The report shall include identification of all devices by manufacturer, nameplate data, design values, measured values and identification tag or mark. The report shall be reviewed by the responsible registered design professional and, when satisfied that the design intent has been achieved, the responsible registered design professional shall seal, sign and date the report.

**909.18.8.3.1 Report filing.** A copy of the final report shall be filed with the building official and fire official and an identical copy shall be maintained in an approved location at the building.

**909.18.9 Identification and documentation.** Charts, drawings and other documents identifying and locating each component of the smoke control system, and describing its proper function and maintenance requirements, shall be maintained on file at the building as an attachment to the report required by Section 909.18.8.3. Devices shall have an approved identifying tag or mark on them consistent with the other required documentation and shall be dated indicating the last time they were successfully tested and by whom.

**909.19 System acceptance.** Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the building official determines that the provisions of this section have been fully complied with, and after the building official and fire official or their designees have witnessed and approved a satisfactory functional test of the smoke control system, and that the fire department has received satisfactory instruction on the operation, both automatic and manual, of the system.

**Exception:** In buildings of phased construction, a temporary certificate of occupancy, as approved by the building official, shall be permitted provided that those portions of the building to be occupied meet the requirements of this section and that the remainder does not pose a significant hazard to the safety of the proposed occupants or adjacent buildings.

**909.20 Smokeproof enclosures.** Where required by other sections of this code, a smokeproof enclosure shall be constructed in accordance with this section. A smokeproof enclosure shall consist of an enclosed interior exit stairway that conforms to Section 1019.1 and an outside balcony or ventilated vestibule meeting the requirements of this section. Where access to the roof is required, such access shall be from the smokeproof enclosure where a smokeproof enclosure is required.

**909.20.1 Access.** Access to the stair shall be by way of a vestibule or an open exterior balcony. The minimum dimension of the vestibule shall not be less than the required width of the corridor leading to the vestibule but shall not have a width of less than 44 inches (1118 mm) and shall not have a length of less than 72 inches (1829 mm) in the direction of egress travel.

**909.20.2 Construction.** The smokeproof enclosure shall be separated from the remainder of the building by not less than a 2-hour fire-resistance-rated fire barrier without openings other than the required means of egress doors. The vestibule shall be separated from the stairway by not less than a 2-hour fire-resistance-rated fire barrier. The open exterior balcony shall be constructed in accordance with the fire-resistance-rating requirements for floor construction.

**909.20.2.1 Door closers.** Doors in a smokeproof enclosure shall be self-closing or automatic-closing by actuation of a smoke detector installed at the floor-side entrance to the smokeproof enclosure in accordance with Section 715.3.7. The actuation of the smoke detector on any door shall activate the closing devices on all doors in the smokeproof enclosure at all levels. Smoke detectors shall be installed in accordance with Section 907.10.

**909.20.3 Natural ventilation alternative.** The provisions of Sections 909.20.3.1 through 909.20.3.3 shall apply to ventilation of smokeproof enclosures by natural means.

**909.20.3.1 Balcony doors.** Where access to the stairway is by way of an open exterior balcony, the door assembly into the enclosure shall be a fire door in accordance with Section 715.3.

**909.20.3.2 Vestibule doors.** Where access to the stairway is by way of a vestibule, the door assembly into the vestibule shall be a fire door complying with Section 715.3. The door assembly from the vestibule to the stairway shall have not less than a 20-minute fire protection rating complying with Section 715.3.

**909.20.3.3 Vestibule ventilation.** Each vestibule shall have a minimum net area of 16 square feet (1.5 m<sup>2</sup>) of opening in a wall facing an outer court, yard or public way that is at least 20 feet (6096 mm) in width.

**909.20.4 Mechanical ventilation alternative.** The provisions of Sections 909.20.4.1 through 909.20.4.4 shall apply to ventilation of smokeproof enclosures by mechanical means.

**909.20.4.1 Vestibule doors.** The door assembly from the building into the vestibule shall be a fire door complying with Section 715.3. The door assembly from the vestibule to the stairway shall have not less than a 20-minute fire protection rating in accordance with Section 715.3. The door from the building into the vestibule shall be provided with gaskets or other provisions to minimize air leakage.

**909.20.4.2 Vestibule ventilation.** The vestibule shall be supplied with not less than one air change per minute and the exhaust shall not be less than 150 percent of supply. Supply air shall enter and exhaust air shall discharge from the vestibule through separate, tightly constructed ducts used only for that purpose. Supply air shall enter the vestibule within 6 inches (152 mm) of the floor level. The top of the exhaust register shall be located at the top of the smoke trap but



not more than 6 inches (152 mm) down from the top of the trap, and shall be entirely within the smoke trap area. Doors in the open position shall not obstruct duct openings. Duct openings with controlling dampers are permitted where necessary to meet the design requirements, but dampers are not otherwise required.

**909.20.4.2.1 Engineered ventilation system.** Where a specially engineered system is used, the system shall exhaust a quantity of air equal to not less than 90 air changes per hour from any vestibule in the emergency operation mode and shall be sized to handle three vestibules simultaneously. Smoke detectors shall be located at the floor-side entrance to each vestibule and shall activate the system for the affected vestibule. Smoke detectors shall be installed in accordance with Section 907.10.

**909.20.4.3 Smoke trap.** The vestibule ceiling shall be at least 20 inches (508 mm) higher than the door opening into the vestibule to serve as a smoke and heat trap and to provide an upward-moving air column. The height shall not be decreased unless approved and justified by design and test.

**909.20.4.4 Stair shaft air movement system.** The stair shaft shall be provided with a dampered relief opening and supplied with sufficient air to maintain a minimum positive pressure of 0.10 inch of water (25 Pa) in the shaft relative to the vestibule with all doors closed.

**909.20.5 Stair pressurization alternative.** Where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the vestibule is required for a minimum of one stair but is not required for other stairs, provided that the interior exit stairways are pressurized to a minimum of 0.15 inch of water (37 Pa) and a maximum of 0.35 inch of water (87 Pa) in the shaft relative to the building measured with all stairway doors closed under maximum anticipated stack pressures.

**909.20.6 Ventilating equipment.** The activation of ventilating equipment required by the alternatives in Sections 909.20.4 and 909.20.5 shall be by smoke detectors installed at each floor level at an approved location at the entrance to the smokeproof enclosure. When the closing device for the stair shaft and vestibule doors is activated by smoke detection or power failure, the mechanical equipment shall activate and operate at the required performance levels. Smoke detectors shall be installed in accordance with Section 907.10.

#### **909.20.6.1 Ventilation systems.**

**909.20.6.1.1** Smokeproof enclosure ventilation systems shall be independent of other building ventilation systems. The equipment and ductwork shall comply with one of the following:

1. Equipment and ductwork shall be located exterior to the building and directly connected to the smokeproof enclosure or connected to the smokeproof enclosure by ductwork enclosed by 2-hour fire-resistance-rated fire barriers.
2. Equipment and ductwork shall be located within the smokeproof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by 2-hour fire-resistance-rated fire barriers.
3. Equipment and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by 2-hour fire-resistance-rated fire barriers.

**909.20.6.1.2 In-take duct detection.** An in-duct smoke detector shall be installed upstream of all fresh air intakes and before entering the smoke-proof enclosure. Annunciation of activation shall occur at the control panel required by 780 CMR 909.21.2.2.”

**909.20.6.2 Standby power.** Mechanical vestibule and stair shaft ventilation systems and automatic fire detection systems shall be powered by an approved standby power system conforming to Section 403.10.1 and Chapter 27.

**909.20.6.3 Acceptance and testing.** Before the mechanical equipment is approved, the system shall be tested in the presence of the building official and fire official or their designees to confirm that the system is operating in compliance with these requirements.

**909.21 Underground building smoke exhaust system.** Where required in accordance with Section 405.5 for underground buildings, a smoke exhaust system shall be provided in accordance with this section.

**909.21.1 Exhaust capability.** Where compartmentation is required, each compartment shall have an independent, automatically activated smoke exhaust system capable of manual operation. The system shall have an air supply and smoke exhaust capability that will provide a minimum of six air changes per hour.

#### **909.21.2 Operation**

**909.21.2.1** The smoke exhaust system shall be operated in the compartment of origin by the following, independently of each other:

1. Two cross-zoned smoke detectors within a single protected area of a single smoke detector monitored by an alarm verification zone or an approved equivalent method.
2. The automatic sprinkler system.

909.21.2.2. ON-AUTO-OFF controls shall be installed in a location approved by the fire department.

**909.21.3 Alarm required.** Activation of the smoke exhaust system shall activate an audible alarm at a constantly attended location.

### **SECTION 910 SMOKE AND HEAT VENTS**

**910.1 General.** Where required by this code or otherwise installed, smoke and heat vents or mechanical smoke exhaust systems and draft curtains shall conform to the requirements of this section.

**Exception:** Frozen-food warehouses used solely for storage of Class I and II commodities where protected by an approved automatic sprinkler system.

**910.2 Where required.** Approved smoke and heat vents, and draft curtains, shall be installed in the roofs of one-story buildings or portions thereof occupied for the uses set forth in Sections 910.2.1 through 910.2.4.

**910.2.1 Groups F-1 and S-1.** Buildings and portions thereof used as a Group F-1 or S-1

occupancy having more than 50,000 square feet (4645 m<sup>2</sup>) in undivided area.

**Exception:** Group S-1 aircraft repair hangars.

**910.2.2 Group H.** Buildings and portions thereof used as a Group H occupancy as shown:

1. In occupancies classified as Group H-2 or H-3, any of which are over 15,000 square feet (1394 m<sup>2</sup>) in single floor area.

**Exception:** Buildings of noncombustible construction containing only noncombustible materials.

2. In areas of buildings in Group H used for storing Class 2, 3, and 4 liquid and solid oxidizers, Class 1 and unclassified detonable organic peroxides, Class 3 and 4 unstable (reactive) materials, or Class 2 or 3 water-reactive materials as required for a high-hazard commodity classification.

**Exception:** Buildings of noncombustible construction containing only noncombustible materials.

**910.2.3 High-piled combustible storage.** Buildings and portions thereof containing high-piled combustible stock or rack storage in any occupancy group in accordance with Section 413.

**910.2.4 Exit access travel distance increase.** Buildings and portions thereof used as a Group F-1 or S-1 occupancy where the maximum exit access travel distance is increased in accordance with Section 1015.2.

**910.3 Design and installation.** The design and installation of smoke and heat vents and draft curtains shall be as specified in this section and Table 910.3.

#### Table 910.3 HERE

**910.3.1 Vent operation.** Smoke and heat vents shall be approved and labeled and shall be capable of being operated by approved automatic and manual means. Automatic operation of smoke and heat vents shall conform to the provisions of this section.

**910.3.1.1 Gravity-operated drop-out vents.** Automatic smoke and heat vents containing heat-sensitive glazing designed to shrink and drop out of the vent opening when exposed to fire shall fully open within 5 minutes after the vent cavity is exposed to a simulated fire, represented by a time-temperature gradient that reaches an air temperature of 500°F (260°C) within 5 minutes.

**910.3.1.2 Sprinklered buildings.** Where installed in buildings provided with an approved automatic sprinkler system, smoke and heat vents shall be designed to operate manually.

**910.3.1.3 Nonsprinklered buildings.** Where installed in buildings not provided with an approved automatic sprinkler system, smoke and heat vents shall operate automatically by actuation of a heat-responsive device rated at between 100°F (38°C) and 220°F (104°C) above ambient.

**Exception:** Gravity-operated drop-out vents complying with Section 910.3.1.1

**910.3.2 Vent dimensions.** The effective venting area shall not be less than 16 square feet (1.5 m<sup>2</sup>) with no dimension less than 4 feet (1219 mm), excluding ribs or gutters having a total width

not exceeding 6 inches (152 mm).

**910.3.3 Vent locations.** Smoke and heat vents shall be located 20 feet (6096 mm) or more from adjacent lot lines and fire walls and 10 feet (3048 mm) or more from fire barrier walls. Vents shall be uniformly located within the roof area above high-piled storage areas, with consideration given to roof pitch, draft curtain location, sprinkler location and structural members.

**910.3.4 Draft curtains.** Where required, draft curtains shall be provided in accordance with this section.

**Exception:** Where areas of buildings are equipped with automatic sprinklers throughout.

**910.3.4.1 Construction.** Draft curtains shall be constructed of sheet metal, lath and plaster, gypsum board or other approved materials which provide equivalent performance to resist the passage of smoke. Joints and connections shall be smoke tight.

**910.3.4.2 Location and depth.** The location and minimum depth of draft curtains shall be in accordance with Table 910.3.

**TABLE 910.3 HERE**

**910.4 Mechanical smoke exhaust.** Engineered mechanical smoke exhaust shall be an acceptable alternate to smoke and heat vents.

**910.4.1 Location.** Exhaust fans shall be uniformly spaced within each draft-curtained area and the maximum distance between fans shall not be greater than 100 feet (30 480 mm).

**910.4.2 Size.** Fans shall have a maximum individual capacity of 30,000 cfm (14.2 m<sup>3</sup>/s). The aggregate capacity of smoke exhaust fans shall be determined by the equation:

$$C = A \times 300 \text{ (Equation 9-10)}$$

where:

C= Capacity of mechanical ventilation required, in cubic feet per minute (m<sup>3</sup>/s).

A= Area of roof vents provided in square feet (m<sup>2</sup>) in accordance with Table 910.3.

**910.4.3 Operation.** Mechanical smoke exhaust fans shall be automatically activated by the automatic sprinkler system or by heat detectors having operating characteristics equivalent to those described in Section 910.3.1. Individual manual controls of each fan unit shall also be provided.

**910.4.4 Wiring and control.** Wiring for operation and control of smoke exhaust fans shall be connected ahead of the main disconnect and protected against exposure to temperatures in excess of 1,000°F (538°C) for a period of not less than 15 minutes. Controls shall be located so as to be immediately accessible to the fire service from the exterior of the building and protected against interior fire exposure by fire barriers having a fire-resistance rating not less than 1 hour.

**910.4.5 Supply air.** Supply air for exhaust fans shall be provided at or near the floor level and shall be sized to provide a minimum of 50 percent of required exhaust. Openings for supply air

shall be uniformly distributed around the periphery of the area served.

**910.4.6 Interlocks.** In combination comfort air-handling/smoke removal systems or independent comfort air-handling systems, fans shall be controlled to shut down in accordance with the approved smoke control sequence.

## **SECTION 911 FIRE COMMAND CENTER**

**911.1 Features.** Where required by other sections of this code, a fire command center for fire department operations shall be provided. The location and accessibility of the fire command center shall be separated from the remainder of the building by not less than a 1-hour fire-resistance-rated fire barrier. The room shall be a minimum of 96 square feet (9 m<sup>2</sup>) with a minimum dimension of 8 feet (2438 mm). A layout of the fire command center and all features required by the section to be contained therein shall be submitted for approval prior to installation. The fire command center shall comply with *NFPA 72* and shall contain the following features.

1. The emergency voice/alarm communication system unit.
2. The fire department communications unit.
3. Fire detection and alarm system annunciator unit.
4. Annunciator unit visually indicating the location of the elevators and whether they are operational.
5. Status indicators and controls for air-handling systems.
6. The fire-fighter's control panel required by Section 909.16 for smoke control systems installed in the building.
7. Controls for unlocking stairway doors simultaneously.
8. Sprinkler valve and water-flow detector display panels.
9. Emergency and standby power status indicators.
10. A telephone for fire department use with controlled access to the public telephone system.
11. Fire pump status indicators.
12. Schematic building plans indicating the typical floor plan and detailing the building core, means of egress, fire protection systems, fire-fighting equipment and fire department access.
13. Worktable.
14. Generator supervision devices, manual start and transfer features.
15. Public address system, where specifically required by other sections of this code.

## **SECTION 912 FIRE DEPARTMENT CONNECTIONS**

**912.1 Required:** All required water fire-extinguishing systems, foam-water extinguishing systems, and *standpipe systems* shall be provided with a fire department connection in accordance with the applicable NFPA standards. Standpipes in buildings under construction or demolition shall conform to 780 CMR 3311 and NFPA 241 listed in Chapter 35.

### **Exceptions:**

1. *Limited area sprinkler systems* supplied from the domestic water system.
2. An *automatic sprinkler system* with less than 20 *sprinklers*.

**912.2 Connections:** Fire department connections shall be arranged in such a manner that the attachment to any one water *sprinkler* connection will serve all sprinklers, and the attachment to any one standpipe connection will serve all *standpipes* within the building.

**912.3 Location:** Fire department connections shall be located in a location approved by the fire department. Such connections shall be located so that immediate access is provided to the fire department. Fire department connections shall not be obstructed by fences, brushes, trees, walls or any other similar object.

**912.4 Height:** Fire department connections shall not be less than 18 inches (457 mm) and not more than 42 inches (1067 mm) in elevation, measured from the ground level to the centerline of the inlets.

**912.5 Projection:** Where the fire department connection will otherwise project beyond the property line or into the *public way*, a flush-type fire department connection shall be provided.

**912.6 Hose thread:** Hose thread in the fire department connection shall be uniform with that used by the local fire department.

**912.7 Fittings:** Fire department inlet connections shall be fitted with check valves, ball drip valves and plugs with chains or frangible caps.

## **SECTION 913 PRIVATE UNDERGROUND FIRE MAINS AND YARD HYDRANTS**

**913.1 Private Underground Fire Mains and Yard Hydrants:** Fire hydrants and underground fire mains installed on private property shall be located and installed as approved by the head of the fire department. Hydrants shall conform to the standards of the administrative authority of the jurisdiction and the fire department. Hydrants shall not be installed on a water main less than six inches in diameter. Standards of construction shall be in accordance with NFPA 24 as listed in Chapter 35.

## **SECTION 914 FIRE PUMPS**

**914.1 General:** Where fire pumps are required to be installed as part of a required or non-required system(s), the fire pump(s) shall be designed and installed in accordance with 527 CMR 12.00 and NFPA 20 as listed in Chapter 35.

**914.2 Rooms:** Fire pumps and all related equipment shall be located in a dedicated room meeting the physical and environmental features of NFPA 20 listed in Chapter 35, and enclosed with not less than two hours fire resistive construction. Fire pumps rooms shall have either direct access to the room from grade or access by a two hour rated passageway and shall be properly secured from unauthorized entry.

**914.3 Emergency power:** All fire pumps shall be provided with emergency power when installed in the following types of buildings or use groups. Emergency power equipment installation shall conform to 527 CMR 12.00 and NFPA 20 as listed in Chapter 35.

1. High-rise buildings as defined by M.G.L. c. 148 § 26A and 780 CMR.
2. Buildings and structures of Use Group A, with a total occupant load of more than 300 occupants.
3. Buildings and structures of Use Group E, with a total occupant load of more than 300 occupants.
4. Buildings and structures of Use Group H.
5. Buildings and structures of Use Group I, having surgery or treatment areas.

#### **SECTION 915 CARBON MONOXIDE PROTECTION**

**915.1 General:** Carbon monoxide protection shall be provided as required by 527 CMR 31.00 and 248 CMR as listed in Chapter 35. All CO detectors utilized in new construction shall be hard-wired, except wireless devices, and all CO detectors and CO detector systems, whether hard-wired or wireless, shall satisfy the requirements of NFPA-720.